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ABSTRACT

This yearbook contains 59 selected articles from the National Reading Conference for 1988 which represent a diversity of topics explored through a variety of research paradigms designed to increase understanding of the critical issues of language and literacy. Included in the collection are "Political and Economic Dimensions of Literacy: Challenges for the 1990s" (M. T. Smith-Burke); "The Social Organization of Literacy Instruction" (R. Barr); "Designing Invitations to Thinking: Some Initial Thoughts" (J. Bransford and others); "Awareness of Text Structure: The Question of Transfer from L1 to L2 (Student Research Award)" (S. A. Hague); "Preschoolers' Use of Metacognitive Knowledge and Strategies in Self-Selected Literacy Events" (D. W. Rowe); "Preschoolers' Conceptions of Literacy as Reflected in Their Spontaneous Play" (S. B. Neuman and K. Roskos); "Factors Associated with Long-Term Reading Achievement of Early Readers" (J. J. Pikulski and A. W. Tobin); "A Structural Approach to Decoding and Spelling" (M. K. Henry and others); "Defining Is an Unnatural Act: A Study of Written Definitions" (C. L. Z. Blachowicz and P. J. L. Fisher); "Task Variations and Prior Knowledge in Learning Word Meanings from Context" (S. A. Stahl); "The Vocabulary of Cultural Literacy in Newspaper of Substance" (J. Willinsky); "When Prior Knowledge Doesn't Facilitate Text Comprehension: An Examination of Some of the Issues" (A. J. Pace and others); "Language as Resource for Mediating Comprehension" (E. I. Reyes and others); "A Critical Review of Reading in Mathematics Instruction: The Need for A New Synthesis" (M. Siegel and others); "Transfer Effects of Instructing Poor Readers to Recognize Expository Text Structure" (R. Weisberg and E. Balajthy); "Strategies for Reading Expository Prose" (T. A. Caron); "Prior Knowledge and Learning from Science Text: An Instructional Study" (J. A. Dole and E.L. Smith); "Considerate Text: Do We Practice What We Preach?" (J. S. Schumm and others); "The Qualitative Reading Inventory: Issues in the Development of a Reading Diagnostic Test" (L. Leslie and J. Caldwell); "What Does Maximum Oral Reading Rate Measure?" (R. P. Carver); "The Contribution of Silent Reading within the Social Context of Instruction" (I. Wilkinson); "The Evolution of Preservice Teachers' Knowledge Structures" (B. A. Hermann); "An Exploration of Text Reading and Reading Group Placement in Third-Grade Students" (D. E. DeFord); "Literature-Selection Strategies and Amount of Reading in Two Literacy Approaches" (K. Mervar and E. Hiebert); and "NRC and the Politics of Literacy" (R. Horowitz and others). (RS)

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COGNITIVE AND SOCIAL PERSPECTIVES FOR LITERACY RESEARCH AND INSTRUCTION

Thirty-eighth Yearbook
of
The National Reading Conference

SANDRA MCCORMICK
Ohio State University

JERRY ZUTELL
Ohio State University

With the editorial assistance of

PATRICIA L. SCHARER
Ohio State University

PATRICIA R. O'KEEFE
NRC Headquarters

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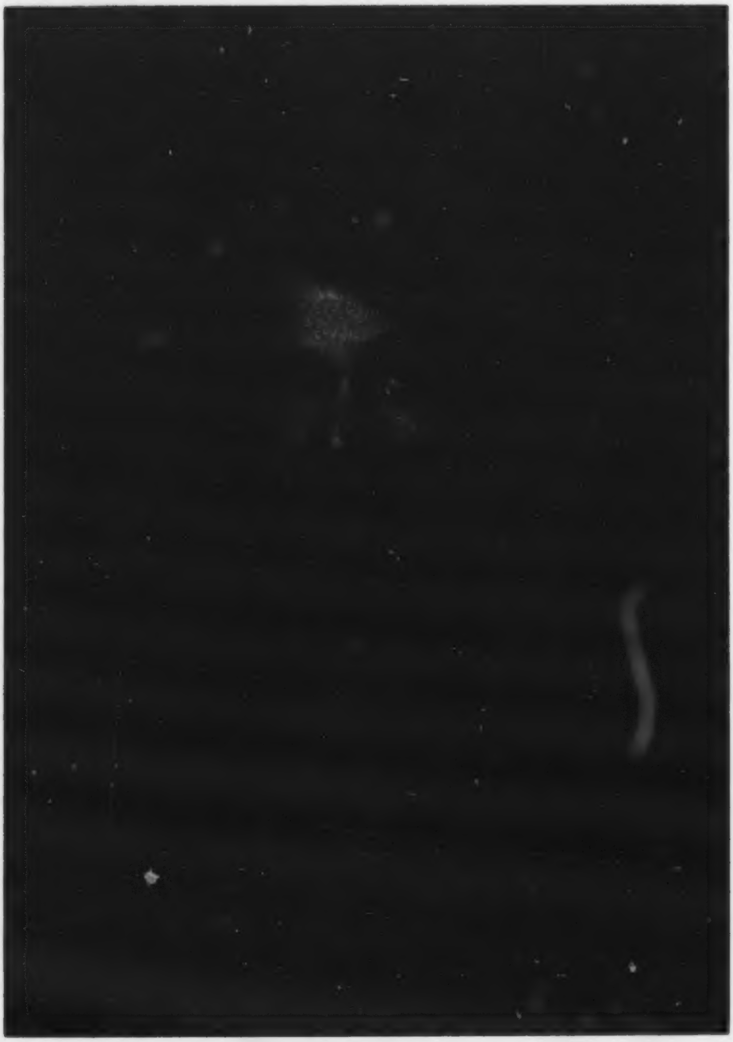
PREFACE

In our first year as editors we have learned that editing a yearbook for a professional organization with the stature of the National Reading Conference has several clear rewards. Foremost among these has been the opportunity to become more closely familiar with the work and thinking of so many of our highly respected professional colleagues. The articles published in this volume present an intriguing diversity of topics explored through a variety of research paradigms. The high quality of the investigations and comprehensive reviews included here has provided us with new insights we will use in our own work, and with increased appreciation of the efforts of NRC members to advance our knowledge and understanding of critical issues related to language and literacy. We are confident that readers of the *38th NRC Yearbook: Cognitive and Social Perspectives for Literacy Research and Instruction* will share these sentiments.

We would like to thank Patricia Scharer, our editorial assistant, for her long hours of hard work and her special dedication to the *Yearbook*. We also want to express our appreciation to the members of our editorial review board and to our guest reviewers for their careful readings and thoughtful suggestions. Their detailed comments were extremely helpful in providing authors with feedback for improving the quality of their manuscripts.

A fifty percent increase in submissions along with a higher acceptance rate (46%) has yielded a longer, more comprehensive volume. We thank the presenters at the 38th Annual Meeting in Tucson for their enthusiasm and the members of the NRC Executive Committee for their willingness to provide the financial support necessary for publishing such a representative *Yearbook*.

Sandra McCormick
Jerry Zutell



Isabel L. Beck

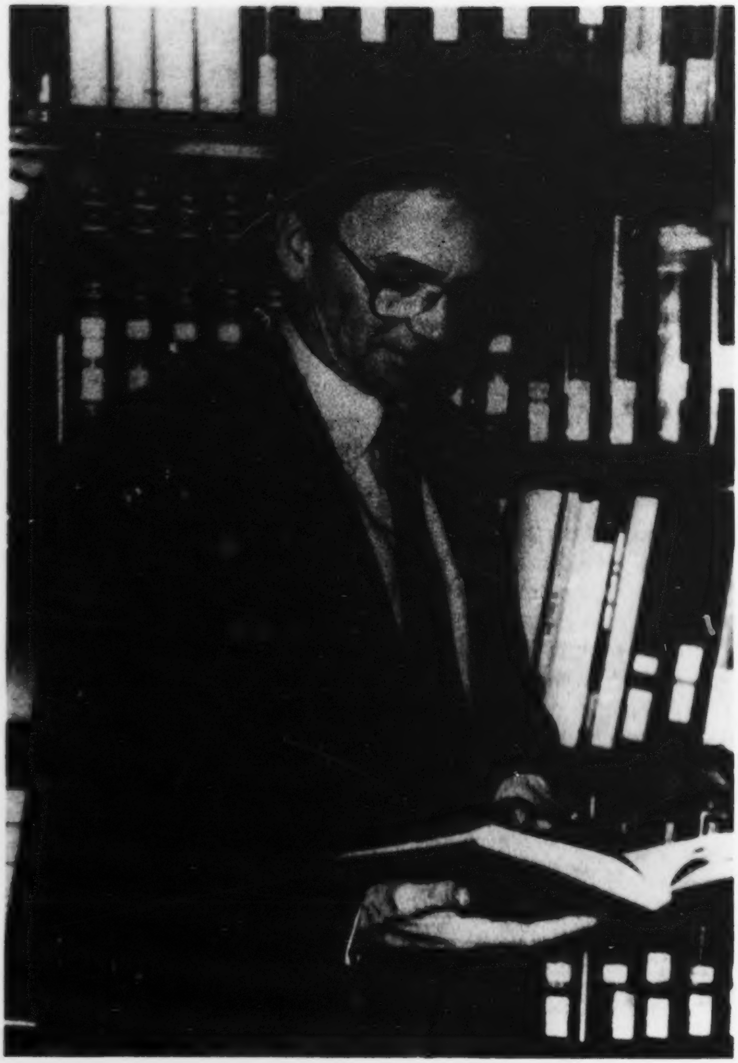
OSCAR S. CAUSEY AWARD

Isabel Beck received her Ph.D. in Education from the University of Pittsburgh where she is currently Professor of Education and Senior Scientist at the University's Learning Research and Development Center. During the past 15 years, Dr. Beck has written over 60 journal articles and book chapters based on her research in reading. She has also developed computer programs and other instructional products for direct classroom use. Recent writing and research interests have focused on important areas such as coherence, content area reading, and developing instructional strategies to help teachers plan effective vocabulary and comprehension lessons. Dr. Beck has served on the editorial boards of *Reading Research Quarterly*, *Journal of Reading Behavior*, and *Cognition and Instruction* as well as on committees for the *International Reading Association*, the *American Educational Research Association*, and the *National Reading Conference*. She is a consultant to the *Electric Company* of National Educational TV and is the senior author of *Reading Today and Tomorrow* (1989), a new K through 8 basal reading program.

In declaring Dr. Beck as recipient of the Oscar S. Causey Award, given for distinguished and substantial contributions to literacy research, James Hoffman, chair of the selection committee said, "Dr. Beck's past record of research is truly outstanding. Her continuing research efforts are an inspiration to us all." Richard Anderson, who previously received this prestigious award, further attested to the "very high quality" of her work in the critical areas of decoding, vocabulary acquisition, and comprehension. He characterized her efforts as thoughtful and painstaking, based on a deep understanding of reading theory as well as practical classroom issues.

Dr. Beck may be described as the consummate scholar who ably weds theory and practice while making substantial contributions to the understanding of both.

Presented by Richard Anderson
December 1988



Thomas H. Estes

ALBERT J. KINGSTON AWARD

Thomas H. Estes received his Ph.D. in Reading Education from Syracuse University in 1970. Currently, he is an Associate Professor of Education at the University of Virginia and Associate Director of the McGuffey Reading Center. In addition to his academic year teaching position, Tom serves as a visiting scholar during summer sessions at National College of Education in Evanston, Illinois.

His current writing interests focus on the relationship between cultural literacy and interdisciplinary study. Tom is co-author of *Reading and Learning in the Content Classroom*, 2nd edition (1985) and *Reading and Reasoning Beyond the Primary Grades* (1986). He has authored many articles and conference presentations on the psychology and pedagogy of reading. Tom's research interests have encompassed attitudes toward reading and subject area study, study skills, and comprehension of textbooks. He has been a principal investigator on an NIE/NSF research project on the relationship between text structure and comprehension. His present research interests center on issues in vocabulary and comprehension.

Tom has been actively involved in the National Reading Conference since 1966. In addition to serving on a variety of committees, Tom has been a member of the Editorial Advisory Boards of both the *Journal of Reading Behavior* and the *NRC Yearbook*. He continues to review manuscripts for both publications and has been a member of the NRC program committee for 12 years. Tom was elected to the Board of Governors in 1979 and worked to rewrite the by-laws of the organization in 1980. He has recently completed a "final" draft of the new NRC Handbook of Policies and Procedures.

No matter what role Tom has played at NRC, his sense of humor has prevailed. A memorable instance is the time he asked Ernest Rothkopf whether one could do mathemagenics on a hand-held calculator. Even at his most irreverent, Tom Estes displays a grace and concern for his colleagues that exemplifies the motto he has suggested for NRC: "Big enough to serve you, small enough to know you."

Presented by Anthony V. Manzo
December 1988

POLITICAL AND ECONOMIC DIMENSIONS OF LITERACY: CHALLENGES FOR THE 1990s

M. Trika Smith-Burke
New York University

Last year at the NRC Presidential Dinner, Ed Fry, our Past President, presented a challenge to NRC members: What are we doing to improve the literacy of minority students and the children of poverty? His question anticipated the current concern about the millions of students who are failing in school, have dropped out of school, or have graduated with less than adequate literacy skills to sustain them in jobs.

My presentation will, first, examine this "literacy problem" which has not only social and cognitive but also cultural, political, and economic dimensions. Then I will suggest possible explanations for why we, as educators and researchers, have not made a significant impact on it. I will argue that literacy is not neutral but always carries with it values, attitudes, and beliefs which are played out politically and economically, and that the psycholinguistic and cognitive models on which most of the current reading research and practice are based are inadequate to help us understand the complexity of the "literacy problem." Next, I will propose that a psycho-socio-cultural model of literacy and literacy learning must drive our research in the future. By using a broader model which forces us to consider dimensions other than just cognitive processing and the resulting products, we will be able to become more aware of the complex interplay of social and cultural factors that influence the development of knowledge, literacy and cognition as well as access to education, economic well-being, and power over one's own life. Finally, I will close with implications for literacy research, education, and policy.

RE-VIEWING THE "LITERACY PROBLEM"

Let's examine some of the dimensions of the "literacy problem" in this country by looking at some recent disturbing findings. The report, *America's Shame, America's Hope: Twelve Million Youth At Risk* (MDC, Inc., 1988), states that

> The crisis is the undereducation of a body of students presently constituting one in three, growing each year as a proportion of our educable young. Dominant in this body are the children of poverty—economically, culturally, racially, and ethnically disadvantaged. They have come to be called youth "at risk" because they are at risk of emerging from school unprepared for further education or the kind of work there is to do. (p. 2)

In this country the nature of the school population is changing rapidly. For example, it is projected that by the year 2000, Hispanics will be the largest minority group comprising 11% of the population (MDC, Inc., 1988). If current immigration rates are maintained, the Asian-American population, 44% of all immigration, will increase dramatically by then as well (Hodgkinson, 1985). It is also estimated that by 2000 over 50% of school children will be from ethnolinguistic and cultural minorities (Heath & McLaughlin, 1987). Although the socioeconomic range of diverse groups will be broader in the future, many of these children will still be considered "at risk" (Hodgkinson, 1985). Not only have the demographics changed in terms of who comprises the school age population, but also where different ethnic groups live has shifted. In his research Labov (1987) has found that

> there is increasing residential segregation of the inner cities . . . not only a segregation of black and white but a segregation of poor, economically deprived blacks from middle class blacks. . . . A large number of black youth go to school only with children from the same dialect background and same economic background as themselves. (p. 144)

This segregation may be creating its own set of problems, since it is more difficult to learn a second language or another dialect or register in English if one rarely hears it or has little opportunity to use it.

The majority of at-risk children come from families living below the poverty level. The Children's Defense Fund provides a startling portrait of such children. There are 13,000,000 poor children in America, or one out of every five. Approximately two thirds of these children are white, more than half are living in families headed by single females, and close to 25% are under the age of six (Children's Defense Fund, cited in Howe, 1986).

The correlates of poverty add to the bleak picture. In *American Youth: A Statistical Snapshot* Wetzel (1987) reported that "regardless of race, children from poor families are more likely to have a learning disability, fall behind in school, and to drop out than those from more affluent households" (p. 12). They are more likely to encounter the juvenile justice system and to be involved in crime in later years.

Teenage girls from low income families are three times more likely to become mothers (Wetzel, 1987). They too tend to drop out of school, find themselves in low paying jobs which perpetuate their poverty level incomes, and are less likely ever to graduate (Kenney, 1987). In addition, youth living in poverty are more likely to be unemployed, and those who are employed often have menial jobs with lower salaries (Wetzel, 1987). The real median income of families headed by 20- to 24-year-olds has dropped 27% between 1976 and 1986; 32.4% were headed by a young, single female. This drop in spending power is almost equivalent to the decrease in real income during the depression years (William T. Grant Foundation, Commission on Work, Family & Citizenship, 1988).

Even though minority and/or poor youth make up a majority of the at-risk population, research has shown "that the single common characteristic of at-risk youth is not race or economic disadvantage, but low scores on tests of basic skills—reading, writing, and computing" (MDC, Inc., 1988). The drop out data tell the story:

- "In the fall of 1985, there were 3.8 million 18 to 24 year olds who had quit school before earning a diploma." (Wetzel, 1987, p. 16)

- Currently we are losing about one million drop outs per year from our schools. (MDC, Inc., 1988)
- The current dropout rate reported by MDC, Inc. is: 39.9% for Hispanics; close to 50% for migrant workers; 42% for native Americans; 40% for handicapped students; up to 50% for rural Appalachian and 60% for rural Southern students. (MDC, Inc., 1988)
- In October, 1986, the unemployment rate for high school dropouts was: 47% for blacks, 17.3% for Hispanics and 20.7% for whites. Black high school graduates were more likely to be unemployed than white or Hispanic dropouts. (Wetzel, 1987)
- Between 1973 and 1984 the decline in male dropouts' real earnings was 41.6% overall, but 61.3% for black males. In contrast, black male college graduates increased their earnings by 16.6%. (MDC, Inc., 1988)

There is little doubt that, as a society, we face a serious problem. The human cost is high and the picture is bleak for these children at the preschool, grade school, high school levels, and in adult life. Most become alienated. They lack hope of getting good grades or having a good school experience. They are often involved with authorities who represent what they perceive as an ineffective and unfair disciplinary system, and they are often truant. None of this helps their low self-esteem. They feel that their teachers do not care about them as people or about their learning. They also sense that they are unable to control their futures and that they have little hope of getting more than a menial, low paying job.

In our 1987 study (Smith-Burke, Parker & Deegan, 1987), all 32 Black Americans who were attending literacy programs in New York City had dropped out of school, and all tested below a 4.9 grade level on program entrance measures. School had not been a positive nor successful experience for most of them. A 20-year-old stated:

> School was a bad experience. When I didn't know how to read a book in school I'd try to tell my teacher but she didn't listen to me. I used to play in the classroom 'cause the teacher wouldn't help me. I'd bother them and the kids a lot. (p. 57)

A 43-year-old confided:

> Teachers didn't care. I couldn't read. At tests, I knew words but couldn't read a book. I hid in my seat then they didn't call on me. If only one teacher would have noticed what was happening. (p. 57)

Ten of our respondents said that they realized they could not read or function adequately at school between fourth and eighth grade. One 27-year-old woman commented that she knew she could not comprehend the work by sixth grade, but there was no one to help. She said that in tenth grade, "I didn't want to leave school, but I did because I didn't get too much out of it" (p. 56).

Clearly what at-risk children face are multifaceted societal problems which involve schooling, socioeconomic status, culture, and linguistic background. The paradox is that the phrase "literacy problem" becomes a kind of shorthand for a serious, complex problem while, simultaneously, use of this phrase simplifies and obfuscates understanding of all the contributing factors. Ironically, the label "literacy problem" also becomes a way to blame the victim and literacy ability becomes an effective gatekeeping device (Gilmore, 1983).

However, I wish to argue that notions about literacy and literacy research can function in a more positive way than as a societal gatekeeper. They can provide a lens through which we, as researchers and practitioners, may be able to become more aware of the broader picture, understand the issues these students face, and discover how we may begin to fight for change. This can only happen if we, as professionals, incorporate new sociolinguistic, cultural, political and economic understandings about language and literacy into our models of literacy used in research and practice.

GOVERNMENTAL ROLES IN LITERACY EDUCATION

At this point the question arises, "What are federal, state and local governments doing about this situation, particularly in education?" According to MDC, Inc. (1988) the amount in real dollars committed to education has decreased 23% in the 1980s. Although the state and local contributions to education have increased 26% and 29% respectively, these monies have been spent on the drive for excellence, including expanded academic requirements, increased teacher salaries, and longer school days. Unfortunately, the increased academic requirements have exacerbated the educational dimension of the problem for at-risk children, since moneys for counseling and remediation have rarely been appropriated for those who will have even more difficulty attaining the new academic standards.

Currently we are faced with woefully inadequate funding for programs which are designed to help many at-risk children, particularly in relation to literacy development. For example, only 20% of low-income children attended preschool and only 40% of the eligible children received needed remediation. Only 25% of the children who have qualified for bilingual education receive it, and only 1 out of 20 receive needed job training (MDC. Inc., 1988).

QUALITY OF EDUCATION

Besides considering the inadequate resources for helping at-risk children, another way to consider the "literacy problem" for low-income, minority children is to examine the quality and effectiveness of their educational experience. In other words, how successful are we in helping at-risk students in the classroom? What becomes evident is the subtle shaping of social inequity in schools.

For example, there is a growing body of research on the instructional differences between low and high reading groups. In contrast to high groups, low groups tend to receive instruction in lower level skills with little emphasis on comprehension. Often there is less time spent on instruction because of disruptions from the children outside the group. In addition, interactions within the low group veer off course as teachers try to help students relate to the work (see Smith-Burke, 1987, for a review of this research). McDermott (1976, 1977) recorded the subtle interplay between Rosa and her teacher which allowed Rosa to raise her hand and seem as if she was participating. However, the teacher never called on her—a subtle collaboration, the goal of which was the avoidance of embarrassment for both the teacher and Rosa. Bloome (in press) might label this a form of "procedural display" which he has recently documented.

Procedural display, or playing the game of school, can be devastating educationally for at-risk students. In Rosa's case it may have preserved peer group status, but it created a context in which learning how to read became almost impossible. Rosa may have learned the social lesson of low expectations and saving face with one's friends.

How successful have we been in providing quality education to the limited group who participate in Chapter I, a program designed specifically to help this target population? Here are some of the conclusions reached by Allington and his colleagues (Allington, 1986).

1. Chapter I services rarely extended the "quantity" of instructional time in reading.
2. The short periods in Chapter I tended to influence the type of instruction, namely short skill exercises rather than extended reading and writing.
3. There was little exposure to full length text reading. The proximity of instructional tasks to real life reading was remote.
4. Instructional tasks tended to focus on accurate oral reading, and/or isolated drill and practice on small units of text, often in the form of seatwork. Few instructional tasks involved higher order thinking.
5. There was little congruence or coordination between the classroom and remedial reading programs.
6. Often students did not understand how to do the tasks or why they were important.
7. A hodge-podge of topics made the possibility for concept development through incidental learning impossible; many topics were unfamiliar.

With its emphasis on fragmented skill and drill, Chapter I does not prepare its students for literacy outside the school any better than low group reading instruction. Even though some Chapter I programs show increases on standardized tests, reports like Allington's challenge their long term, overall effectiveness. Generally a child assigned to Chapter I stays in Chapter I (Levin, 1987). As Levin points out, there are rarely high expectations or criteria and a target date set for discontinuing a student. Often, when students discontinue the program gains are not maintained in the regular classroom. This research on the effectiveness of programs such as Chapter I and on grouping practices at the class and school levels certainly raises questions about access to quality education as well as equity for at-risk students.

Two additional questions should be raised about the policy of tracking: (a) Who ends up in the lower tracks? (b) Are differential curricula used in lower tracks? Gilmore (1983) documented that black middle-grade children from inner city Philadelphia were denied access to the academically more rigorous literacy program on the basis of what teachers called "attitude," not on the basis of their literacy skills. She found that these students had many different literacy skills but these skills were not "counted" as literacy in school. Oakes (1985) found that a student's race, class or family-based access to knowledge about college and career had a greater effect on tracking than intelligence or actual potential. She found that students rarely escaped a lower track, and once they were placed, they eventually adopted the behavior which justified the placement.

Oakes found major differences in the quality of literacy education of the high and low track students. The higher tracks (like the high reading groups) stressed skills and behaviors required of the higher level jobs—to think critically, analyze, ask questions, communicate with teachers as friends, have confidence, to form one's own opinion supported by facts, and not to be swayed by others without examining the issues, whereas the lower tracks stressed lower level functional and social skills representative of the lower level jobs—how to fill out forms, write a check, get a job, follow directions, work with others or alone, having good manners, and respect for others.

Graff (cited in Gee, 1988) points out that throughout history there has been a two-tiered system directed by those in power, as is clearly evident in Oakes' research. The behaviors and attitudes of docility, time management, honesty, respect for authority are stressed for the lower class, and verbal and analytic thinking, evaluation, and discursive thought and writing for the higher class. He also reports that literacy has been used to maintain the position of those in power, insuring that the less affluent accept the values, norms and beliefs of the system even when it may not be in their best interest. For example, lower class speakers often overuse and misuse prestigious forms of language and criticize members of their own group for using their own dialect. Historically there has been an underlying fear that by teaching lower class members the critical literacy skills of those in power they will no longer be satisfied with lower level jobs and the values, beliefs, and attitudes of the existing system.

IDENTITY, LANGUAGE, AND CULTURE: OBGU'S THEORY

The relationship between lower class minority groups and the dominant white society is a complex one. John Ogbu (1987) offers us additional insights into it. He argues that previous research which has attributed failure to a variety of language factors does not provide an adequate explanation for the differential performance of poor minority students in school (see Lindfors, 1987). Sociolinguists have offered evidence which counters these claims of a "deficient," "impoverished," or "deprived" language base. It is interesting to note that the data leading to the notions of language "deficiency" were collected in school settings. In contrast, the sociolinguistic data leading to the notion of language "differences" have often been collected in non-school settings. The work of Labov is a notable example—he recorded the use of complex, propositional language by black teenagers in arguing about the existence of God.

Other possible explanations of differential school performance have come from research which has documented different *cognitive styles* (Ramirez & Castenada, 1974), *interaction styles* (Erickson, 1975; Erickson & Mohatt, 1982), *narrative styles* (Boggs, 1972; Michaels, 1981; Michaels & Foster, 1985; Scollon, 1988) and *teaching/learning styles* (Philips, 1983). The question raised by Ogbu (1987) is: Why have some minority groups that have some of these same styles been able to benefit from American schooling while others, notably some black Americans, native Americans (including various Indian groups, native Hawaiians, Eskimos), and Hispanic migrant workers (Mexican Americans and Puerto Ricans), have not.

Approaching the problem from a social, cultural, economic, and political perspective, Ogbu offers another explanation which does not negate stylistic differences. First, Ogbu posits the existence of three types of minority groups. *Autonomous minorities* are those that are usually not socially, economically, or politically subordinated, although they have experienced some prejudice and discrimination. The second group, which he calls *immigrant minorities,* have moved voluntarily to this country for the economic opportunity and political freedom they believe is offered here. The third group is what he calls *caste-like or subordinate minorities* who originally were brought to this country involuntarily through slavery, conquest or colonization, or because of irreversible economic and/or political situations in the country of origin. This latter group has experienced limited access to jobs and denial of true assimilation into the mainstream culture.

I do not wish to argue the validity of these specific categories but, instead, to look at the problems which Ogbu suggests occur for caste-like minorities, since I think this may shed light on some of the problems we must overcome to provide quality education for poor minority populations such as black Americans, migrant workers, refugees, and native Americans.

Ogbu agrees with Graff (cited in Gee, 1988) that one of the societal purposes of schooling is to prepare workers and consumers to believe in and support the existing economic system. Schools do this by teaching the beliefs, values, and attitudes and the necessary related skills such as literacy and numeracy, which reflect the system and the dominant culture, and by promoting certain habits and providing certain credentials for behavior and knowledge which are compatible with system values and the world of work.

Since they arrived in the U.S., caste-like minority groups have faced economic barriers and discrimination which have prevented them from getting ahead. For them the value of education has become illusive. Though some give lip service to education as the route to success, Ogbu argues that some have turned to alternate "folk theories" for getting ahead, such as pursuing sports, entertainment or in some situations making it outside of the system. Literacy and/or school success are not prerequisite for these fields.

Ogbu also proposes that in order to protect its collective or social identity, a caste-like minority develops what he calls a secondary cultural/language system which consists of ways of behaving, perceiving, feeling, and speaking generated *in opposition to a dominant cultural/language frame. In reality it is a difference in style, not content.*

Because of this oppositional frame caste-like minorities may resist learning what is viewed as the language and behaviors of the dominant culture in school, since to learn this would be a threat to their cultural identity and sense of security. The defiant behavior that teachers in Gilmore's study called "attitude" may be an example of this type of resistance.

As another example, the observations of Dearich Hunter published in *Newsweek* magazine in 1980 (cited in Ogbu, 1987) illustrate the conflict. Hunter referred to four groups of black students in his Delaware high school. The "rocks" or the majority have given up hope of making it in school or in a job because their parents and older friends were all unemployed. The "hard rocks" were also caught in what he called the deadly dead-end environment (including drug use and crime) and could not see a way out. The "ducks," or the kids who still believed in school, tried to succeed but took incredible abuse from the "hard rocks." And finally the "junkies" were the "hard rocks'' who tried to become ''ducks'' and were ostracized so completely that they usually turned to serious drug use.

Labov (1987) has recorded the different language patterns based on membership status in peer groups of South Harlem adolescents. Peer group members of the ''in-group'' often show much lower reading scores, while outsiders tend to score at about grade level. Labov concurs with Ogbu:

> The evidence points to the fact that the adolescent peer group in the inner cities institutionalizes resistance to the norms, the ideology and the practices of the school system. This resistance appears to be the result of a political and cultural conflict between the vernacular speakers and the school authorities. The linguistic behavior of peer group members is a reflection and a symbol of this conflict. (Labov, 1982, p. 139)

Another by-product of the oppositional frame and inequitable access to quality education is the sense of conflict and distrust toward whites and their institutions felt by caste-like minority group members. Tests, textbooks, tracking, are considered discriminatory. There is a distrust of the knowledge taught and the services provided which often leads to tensions and/or demonstrations for equity on local school boards. In turn, the distrust of schools may be passed from one generation to the next.

Labov takes the position that if it is important for these poor minority students to take on the language and behaviors which lead to literacy and full participation in mainstream culture (e. g., learning mainstream dialects and registers), ''a reorientation of peer group pressures towards the work required to achieve high levels of literacy must be one of the primary goals of an educational policy that would reduce unequal opportunity in our society'' (p. 139).

In summary, we have an inequitable system of schooling in which poor minority students receive a different, less adequate education (including literacy skills) than their counterparts from the mainstream. Due to discrimination and economic barriers, oppositional behaviors have been adopted, making change that much more difficult to pursue. If we are to continue to try to understand and improve minority education, it is clear that literacy and education can no longer be thought of just in terms of cognitive processes, instructional factors or just the contextual factors of classroom instruction. Our frame must be expanded to a broader perspective including social, cultural, economic, and political dimensions as well as the cognitive. We must realize that by selecting a particular model of literacy on which to base our research and practice, we are in fact making a political statement about the kinds of language, literacy, attitudes, and behaviors we value. Groups such as NRC need to clarify what they believe and value concerning literacy and literacy education for minority and low SES students, but they also have a responsibility to understand what these groups want for themselves.

THE ROLE OF RESEARCHERS

The next question which I asked was what role have we as researchers played in examining this literacy problem of poor minority students. I would hypothesize that our research has been limited by at least two factors: the lack of interest and/or access to minority populations and the de facto bias of our quasi-experimental literacy research, which is based on our current, limited models of reading.

To examine these issues I surveyed the articles in our two major journals, *Reading Research Quarterly* and the *Journal of Reading Behavior*, for the last 10 years. First, I wanted to see how many studies focused on at-risk populations. I thought that this would be a simple task. Not so! Often the descriptions of the subjects in the studies were so vague that there was no way to determine who the subjects really were. Typical were statements such as 120 seventh-grade students from two comprehensive junior high schools in central Illinois participated in the study, or 40 second-grade average readers and 40 third–sixth grade, poor readers participated as subjects. Researchers included detailed descriptions of experimental variables such as how good and poor readers were selected, but descriptions of cultural and socioeconomic factors were sparse, except in the case of middle-class subjects. What is meant by suburban, rural, urban, working class or lower middle class is anyone's guess. We really have no consistent, detailed, agreed-upon way to describe subjects. Length of the article seems to be a major determining factor.

But as one would probably predict, most studies from which researchers drew conclusions about cognitive processes in reading were conducted with white, middle-class children or college populations. Only a handful of studies, most of them instructional studies, clearly described samples of low SES and/or minority students. What this means is that, de facto, our notions of the reading process and instructional effectiveness are based on the functioning of white middle-class students and reflect the dominant culture's values and understanding of literacy. Occasional studies like those of Steffensen (Steffensen, Joag-Dev, & Anderson, 1979), Reynolds (Reynolds, Taylor, Steffensen, Shirey, & Anderson, 1982) and their colleagues uncovered important interpretive differences of certain cultural groups, but there has been no programmatic attempt to continue to explore interpretive or value differences in relation to culture, gender, or class since then. For the most part, patterns associated with socio-economic and cultural patterns are relegated to the error term.

In addition, we must consider the possible influence of the quasi-experimental paradigm and our current models of reading. In this type of study the researcher selects particular literacy tasks which require choosing materials and situations to fit the tasks. These selections are made according to the researcher's values and the nature of the problem he or she wishes to investigate. Often the task situations are test-like. Consequently, perceived importance and willingness to complete tasks which may not be clearly related to real life reading or writing become important factors. Because of the need to focus and control variability, the researcher may select any unit of language from phoneme to complete text. The original discourse is often no longer intact. Thus interpretation may become difficult. Materials, for the most part, are either written for experimental purposes or selected from school-based texts. Consequently these texts tend to reflect dominant cultural values about literacy.

Because of the factors just mentioned, most studies tend to reflect elements of the dominant cultural frame which Ogbu describes as problematic for poor black students, particularly those who are coming from a caste-like minority. Whether or how these factors have affected the results of studies cannot be determined systematically.

In summary, a potential for bias must be considered due to (a) the materials, particularly topics, writing styles, and genres; (b) the isolated nature of the skills being investigated, and (c) the test-like situations involved in data collection. Even the notion of generalizability must be reconsidered, since the influence of general economic, political, and sociocultural contextual factors are often ignored in the experimental setting.

We have so little data on the literacy practices of linguistically and culturally different populations in and out of school, particularly for low SES minority groups. Consequently we do not know which settings, tasks, or materials are most appropriate to understand the literacy abilities and values of these students, nor do we know what minority and low SES parents believe and value about literacy and literacy instruction for their children. From research we usually learn what at-risk students *cannot* do, not what they *can* do. As researchers and practitioners, we also tend to be unaware that we are imposing our own concepts and values about literacy in very subtle ways.

If, as professionals, we are interested in literacy and literacy education across *all* groups, I want to argue that as a first step, we need an expanded model to help us think about the broader definition of literacy and literacy learning. What might be the essential features of this expanded psycho-socio-cultural model of literacy? In completing the next section of this paper, I have drawn heavily from the work of the linguist James Gee, from University of Southern California (1987, 1988), to construct this preliminary attempt at definition.

AN EXPANDED MODEL OF LITERACY

First, the psycho-socio-cultural model assumes that all literacy has social, cultural, political, and economic as well as cognitive dimensions. In using literacy, individuals do so through the filter of the values, beliefs, and attitudes of their cultural and social groups.

Underlying all language use, whether oral or written, is the concept of discourse. Gee (1987) defines it as follows:

> a socially accepted association among ways of using language, of thinking, and of acting that can be used to identify oneself as a member of a socially meaningful group or "social network." (p. 1)

Though possibly redundant, the idea of cultural identity needs to be added explicitly to this definition. Gee refers to one's discourse as a kind of "identity kit" which comes with all the ways to be communicatively competent—how to act, talk, interpret, and think according to a particular cultural or social group. Everyone learns many different discourses during their lives. Like oral language, literacy is not seen as separate from the particular discourses which a person controls.

For example, consider an educator. Educators have ways of speaking, reading, writing, and acting which are meaningfully related to their institution, called education, which has its own knowledge base, norms, values, attitudes, beliefs, and a shared historical context. Other discourses could emanate from being a member of a particular minority group, or a member of a church or country club.

Gee proposes five key points about the nature of a discourse which provide a frame for the psycho-socio-cultural model.

1. Ideological in nature, a discourse implies certain values and viewpoints which must

be reflected in one's speaking and acting or one is no longer considered a member of that group.

2. "Discourses are resistant to internal criticism and self-scrutiny" (p. 2), carefully defining what is considered acceptable criticism. Often when people wish to learn another discourse, they become critical of their own discourse. This sometimes forces them to try to adopt a new discourse as their primary discourse because their primary discourse group no longer accepts them as part of the group. Sometimes they feel they no longer belong to the original group, nor are they fully accepted by the new group. Richard Rodriguez' (1982) autobiography, *Hunger of Memory*, is a case in point. From an anthropological perspective cultural groups tend to be ethnocentric in their view of the world, feeling that their "ways" are "better" than those of other groups. (Perhaps familiar would be a more appropriate term!) If persons adapt too far beyond the norms of their social/cultural group, they may find themselves viewed with suspicion, isolated, or even ostracized.
3. A discourse is not only defined internally but also in relation or opposition to other discourses. For example, as Labov (1987) and Ogbu (1987) noted, the discourse of some minority groups may be defined in opposition to that of mainstream students in a school. This makes the task of promoting the exploration and learning of several discourses a difficult one, since the values, beliefs and attitudes may be in conflict, not just the styles of expressing ideas.
4. Any discourse is concerned with and puts forward certain concepts, viewpoints, and values at the expense of others. Inevitably it will devalue certain concepts and viewpoints of other discourses, for example, the value assigned by academics in their discourse to the essayist tradition as compared to the discourse used by native Alaskans (Scollon, 1988). Native Alaskans value experience over the formal syllogistic logic of language in print.
5. Discourses are intimately related to the distribution of social power and the hierarchical structure of society. Control over certain discourses leads to the acquisition of social goods (money, power and status) . . ." (Gee, 1987, p. 3). The extent to which members of a dominant group wish to permit access to the discourse(s) associated with their group is a critical factor in education, upward mobility and economic success, particularly for minority and low SES groups. In her discussion of what she calls the culture of power Delpit (1988) suggests that, "Those in power are frequently least aware of—or least willing to acknowledge its existence. Those with less power are often most aware of its existence" (p. 282).

Given these five characteristics of a discourse, Gee (1987) posits that each of us acquires a primary discourse by being a member of a family and within this setting we learn particular uses of language, values, and interpretations of the world (see Taylor & Dorsey-Gaines, 1988 for a study examining this process in several inner-city, black families). In addition, we all must acquire what Gee calls secondary discourses, such as the language of schools, stores, peer groups, and so forth. Learning a secondary discourse may involve learning how to communicate with "strangers" who do not necessarily share our knowledge base, values, beliefs, or attitudes. There may be particular characteristics associated with the literacy related to a secondary discourse. The extent to which one's primary discourse is congruent with secondary discourses, not only in form but also in values and viewpoints, may facilitate acquisition of both oral and written modes of that discourse. One might also argue that students who acquire language and literacy in the discourses of the dominant cultural groups may have a greater chance of succeeding economically.

Literacy involves uses of primary and secondary discourses, which involve different kinds of reading, writing, speaking, and listening, which foster the continuing development of thinking, knowledge, and values associated with these discourses. Scribner and Cole (1981) have shown that literate "thinking" depends on the particular literacy functions and on the discourses in which they are grounded. A range of cognitive abilities and values are associated with each function. For example, the literate "thinking" used by the Vai to read the Koran involved rote memorization; the value to the group was extremely high. In contrast, another highly valued literacy practice of writing letters, which involved the use of non-situational language, required cognitive operations such as analysis and synthesis.

Literacy acquisition in the psycho-socio-cultural model is achieved through use of a variety of literacy practices in many different meaningful, social/cultural contexts. One of these contexts is school, where students engage in a limited set of literacy tasks which are often obliquely related to real world literacy tasks, but reflect dominant social/cultural values. Scribner and Cole (1981) conclude: "School fosters abilities in expository talk in contrived situations" (pp. 242–243) which are necessary to function in certain formal, societal institutions.

Gee distinguishes between "acquisition" of literacy, during which language is developed through use in context in particular meaningful ways, and "learning" literacy which involves "conscious knowledge gained through teaching . . . or some degree of meta-knowledge" (1987, p. 9). Some cultures stress acquisition through the use of modeling and apprenticeships, whereas others stress teaching/learning during which tasks are analyzed, broken down and explicitly taught. Gee posits that "acquisition" and "learning" are both necessary; the first stresses performance, the second meta-knowledge and cognitive operations such as explication, analysis, and critical thinking. He argues that:

> Any discourse (primary or secondary) is for most people most of the time only mastered through acquisition, not learning. Thus literacy is mastered through acquisition, not learning, that is, it requires exposure to models in natural, meaningful and functional settings, and teaching is not liable to be very successful—it may even initially get in the way. Time spent on learning and not acquisition is time not well spent if the goal is mastery in performance. (p. 9)

He adds, as does Paulo Freire (Freire & Macedo, 1987), that to be truly powerful in the use of language and literacy, one must be able to analyze and critique both primary and secondary discourses. Freire goes on to say that a critical, empowering perspective can only be developed when children use their own discourse as a point of departure which helps them see and value their own cultural identity. Critical literacy involves "acquiring" literacy based on one's own discourse, and then thinking about and reconstructing other groups' language and literacy critically to understand the social, cultural, political, economic, and historical dimensions of their world from other perspectives as well as one's own.

In summary, the psycho-socio-cultural view of literacy involves the use of primary and secondary discourses in both oral and written modes. Reading and writing are not viewed as just tasks but are enmeshed in cultural and social webs of values, attitudes and beliefs which tend to be overlooked in our current narrow models of literacy. To be more effective in designing research and programs for at-risk students we need to take into account how language and literacy are learned from this broader perspective and we also need to make explicit our own views and values concerning literacy, since these will inevitably influence the conceptual frame, design, methodology, and conclusions that we draw from our studies.

IMPLICATIONS FOR RESEARCH, EDUCATION, AND POLICY FOR AT-RISK STUDENTS

I'd like to close with some implications of the psycho-socio-cultural model for literacy research, education, and policy for at-risk students.

First and foremost, we need to unpack and make explicit our values, beliefs, and attitudes about our own literacy and literacy for others. Our own literate myopia makes this difficult. My work with adults has been enlightening. Although some adults come to literacy centers to learn literacy skills that will help them get a job, others who have what some educators might consider "low level" literacy are operating quite successfully. They have supportive social networks of friends, relatives, and acquaintances to help them with particular skills they lack. Is this really different from one of us hiring a lawyer or an accountant to complete certain specialized literacy tasks for us?

In unpacking our own notions of literacy and literacy for others one might ask oneself a series of questions:

> Which "discourses" do I control?
> What is my definition of literacy?
> What kinds of literacy tasks and materials do I value?
> How do I view others who do not have *my* definition or values?
> What power do I have in relation to others (e.g., teachers, researchers, administrators, children, parents) associated with literacy events?
> How do I use that power when literacy is involved?

The controversy surrounding Lisa Delpit's article in *Harvard Educational Review* (1986) concerning the use of writing process with minority children was generated by two different agendas and value sets, one on the part of black educators and the other on the part of some process-writing educators (who are for the most part white). The former feel that too many mechanical errors (e.g., spelling errors or grammatical errors) in black children's writing will be judged negatively by the world at large. They feel strongly that editing skills need to be taught explicitly. They are deeply concerned about a sociopolitical issue (i.e., access to mainstream society) as it is played out in writing instruction.

On the other hand, educators interested in process writing focus on a different issue, namely maintaining the meaning focus of writing instruction to ensure that it does not move back to teaching only skills and grammar. They are deeply concerned over theoretical issues fought over within the profession and how they are carried out in instruction.

I would argue that this type of disagreement is best solved at a local level. The first step toward dealing with such an issue is to have all interested groups involved, and to try to create a context in which each group explicitly defines their values, attitudes, and beliefs about literacy and what each group wants for all children—not just in terms of writing, but also in terms of access to mainstream culture. A negotiated curriculum can emanate from this point. Clearly this is no small task. I recommend Delpit's more recent article in *Harvard Educational Review* (1988) in which she gives some powerful examples of teachers who have found meaningful ways to help at-risk children expand their language repertoires.

Another implication of this model is the need to document literacy uses, both in mainstream life and in the lives of different cultural groups. What are the best social contexts to foster empowerment through literacy acquisition and learning in and out of school? The research by Scribner and Cole (1981) with the Vai in Africa, by researchers in the Michael Cole's lab in San Diego, by Sarah Michaels (1981) in Cambridge, by Perry Gilmore (1983) formerly in Philadelphia, and Ron Scollon (1988) in Alaska are notable examples of this kind of research. We need to study literacy in the context of social groups and institutions that shape the ways people interpret their worlds and ask how this does or does not carry over into schools. The recent work by Bloome, Puro, & Theodorou (in press) is also exemplary. In examining literacy in schools, we need to document how the mainstream definitions of literacy create the gatekeeping system that prevents at-risk students from gaining access to quality literacy education and mainstream culture. We also need to know more about successful programs collaboratively developed by community groups and schools to help at-risk students.

It is interesting to note that in her 1987 keynote address at AERA, Lauren Resnick outlined the differences between teaching/learning in and out of school. In school learning stresses individual cognition, pure mentation without aids, symbol manipulation and generalizable abilities; whereas out of school learning stresses shared cognition, tool manipulation, contextualized reasoning and situation-specific competencies. She calls for a rethinking of school to capture the best of both in- and out-of-school teaching and learning. Perhaps as we collect more data on literacy practices of at-risk students both in and out of school, we can begin to structure literacy experiences which will help at-risk students accomplish their goals.

An implication from the psycho-socio-cultural model for literacy education is the need to immerse students in situations where they can experience a wide variety of dialects and language registers or a second language. One method to accomplish this is the type of project that Shirley Brice Heath has used with older students who conduct an ethnography of communication in their English class. In Amanda Branscombe's freshman English class (Heath & Branscombe, 1985), attended by students considered below average, the students not only examined their own language and literacy but also that of their families. In Chicago, Carol Porter, an eighth-grade teacher, and Linda Crafton, a university professor (Crafton & Porter, 1987), had the students correspond with Dr. Crafton about the books they were reading and complete a project for which they interviewed several people holding different kinds of jobs to understand the role of language and literacy in these contexts. By being involved in a lot of meaningful reading and writing, and by reflecting on the language use of other people, the students' reading and writing improved and they began to see why reading and writing were important in the "real" world.

Another implication for literacy development and education in general is the notion of collaborative, alternative education involving children, parents, teachers, and administrators in the development of schools. This is not a simple task, as Deborah Meier (1987, and personal communication, 1988) of New York City's Central Park East schools can tell you. It involves hours of sharing, collaborative conceptualizing, planning, and continuous revising to make sure all groups have a voice in shaping the curriculum. The payoff is great. Ms. Meier started with one small elementary school. There are now two more based on this model. Currently they are also developing Central Park East Secondary School, a school from Grades 7 through 12. The goal is to create a high school with quality education for all the different cultural groups in the district based on Theodore Sizer's ideas about improving the academic curriculum. In this case reform to achieve higher academic standards is being designed to include linguistically and culturally different students, rather than to create additional academic pressure which might cause them to drop out. The Park East schools are the type of schools which acknowledge the resistance and opposition felt by minority students and parents. The staff works hard to build the trust necessary to help parents and students realize that education can work for them, not against them.

The final implication is at a policy level. Ogbu (1987) argues cogently about the role that job ceilings and economic barriers have played in shaping negative values towards literacy and schooling. In light of our most recent election, I feel that the position that I am going to take is almost ironic: It is absolutely critical that policy be implemented to eliminate job ceilings and other discriminatory barriers based on ethnicity, race, class, and gender. Some might say that this policy is already in place. However, documented violations abound. I feel strongly that, given my political beliefs, I must become more politically active. What are your beliefs on this issue?

Viewing literacy from the psycho-socio-cultural perspective may not be popular, since it requires dealing with cultural, social, economic, and political values, beliefs, attitudes, and norms which may be different from our own. Many of these factors have been avoided in the past, particularly in literacy research circles. I would like to close with a quotation from James Gee that summarizes the dilemma that literacy researchers and educators face when confronting the literacy problems of at-risk students:

> . . . A text, whether written on paper, on the soul (Plato), or on the world (Freire) is a loaded weapon. The person, the educator, who hands over the gun, hands over the bullets (the perspective), and must own up to the consequences. There is no way out of having an opinion, an ideology and a strong one—as did Plato, as does Freire. Literacy education (and I would add—literacy research) is not for the timid. (p. 208)

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THE SOCIAL ORGANIZATION OF LITERACY INSTRUCTION

Rebecca Barr
National College of Education

Ability grouping is pervasive in American schools, particularly for reading instruction at the elementary level. Despite its prevalence, or possibly because of it, it is a practice that most of us have taken for granted. Recently, however, several forces have converged to make us reconsider how we group students for reading. Perhaps most important among these is the ideological thrust that identifies ability grouping as a scheme that violates the principle of equal educational opportunity. The recent court decision, *Moses v. Washington Parish School Board* (1971) objected to ability grouping in theory on the grounds that educational research does not justify its use. At the same time, the movement toward a more unified language arts curriculum, against fragmentation, seems to have influenced our thinking about ability grouping. Teacher awareness of the importance of student interaction in cooperative work groups may also have had a bearing. Whatever the reasons, we are now in a period in which we are reevaluating this longstanding practice of grouping students for reading instruction on the basis of ability.

During the past year I have been reading and rereading the literature on ability grouping (Barr & Dreeben, in press). It is my purpose here to share with you some things that I learned about it, particularly those that surprised me. I also want to criticize some of the conclusions that are being drawn from the research and to offer my own interpretations. To do this, I have organized this paper into four main sections. In the first, I focus on the history of ability grouping for reading instruction, inquiring about when and why the practice arose. In the second, I consider the body of research on ability grouping and the conclusions we can draw from it. In the third, I describe more recent studies of reading groups, but then suggest an alternative conclusion. In the final section, in thinking about what may be the main thrust of research in this area in the future, I describe some interesting discoveries that I have recently made about group composition.

HISTORY OF GROUPING FOR READING

Grouping students on the basis of ability and age is part of a larger package of practices that has involved attempts to standardize schooling. In the United States, the impulse to regularize education goes back at least to the 1830s. According to Tyack (1974), Horace Mann was greatly impressed by the "supervision, graded classes,

[and] well-articulated curriculum'' (p. 35) he found in Prussian schools. The common school movement, which Mann and others led, contributed to the rapid expansion of schooling in the mid-1800s. The first American graded school was founded in Boston in 1847 and was adopted in all parts of the nation during the next quarter of a century (Otto, 1932).

Curricular developments accompanied the development of graded schools. The first graded readers were written by Samuel Wood early in the 19th century, probably for the Lancasterian schools (Venezky, 1988); others such as those written by the McGuffeys followed. This grade level articulation of the reading curriculum anticipated and supported the development of graded schools. It was the rapid expansion of schooling during the mid-1800s that led both to graded classes and the use of graded reading materials.

Later, however, problems with age graded classes arose because of great differences among students within grades. One response developed in 1862 by W. T. Harris, the superintendent of the St. Louis schools, was to group students into classes on the basis of their academic progress (Kliebard, 1986). This was the first example of ability grouping within grade levels. Another approach to the problem of diversity within classes, developed by P. W. Search in Pueblo, Colorado in 1888, was to individualize instruction.

A second period of expansion in schooling occurred at the turn of the century as new waves of immigration occurred. At the same time, a progressive era began in education accompanied by the scientific study of learning. Because of developments in educational measurement, individual differences were recognized. At the same time, based on principles of psychological development, school people became concerned with individual differences (Kliebard, 1986).

In response to these conditions, schools developed various methods for organizing students in grouped settings so that all students would benefit from instruction. The approaches included various grouping plans identified with their respective cities (Joplin, Detroit, Winnetka, Denver, Gary, Dalton), individualized instruction, graded and nongraded schooling, schemes for regulating the number of years required to complete elementary school, schemes for enriching and extending the curriculum within a fixed period of time for program completion, automatic promotion, and continuous progress. Each attempts in different ways to accomplish this goal by altering the time set aside for completing a program, the criterion for deciding when the curriculum has been mastered sufficiently to justify moving onward, the difficulty and richness of curricular content, the frequency of promotion, and the composition of classes and grades (Otto, 1932; Purdom, 1929).

During this same period when administrative plans were developed, teachers also began grouping students within their classes for reading instruction. Although it is difficult to date the emergence of this practice, one of the earliest references, found in the *Story Hour Readers Manual* (American Book Company, 1913), suggests separate groups for those who ''progress rapidly'' and for those who are ''slow and need more assistance.''

As reading groups within classes became more common during the 1920s and 1930s, basal reading programs also underwent change. They became easier at the lower levels through the addition of preprimers and the creation of easier stories through increased word control and repetition (Smith, 1965). They also became more comprehensive, and included both teacher's guides and workbooks for skill practice. Indeed, the comprehensiveness of the basal programs used with ability groups for reading instruction and instruction of total classes in spelling, writing and other language arts may have fostered the separation of reading instruction from the other language arts.

For a second time, then, we see shifts in the organization of curricula that parallel changes in how students are grouped for instruction. Our current reconsideration of ability grouping also has implications for curricular programs in reading and language arts. Indeed, as mentioned earlier, the reconceptualization of the processes of reading and writing and the consequences of this reconceptualization for curriculum and instruction may well be one of the forces that has encouraged the reevaluation of ability grouping. As curricular tasks become more broad-gauged, permitting students to respond to them on a variety of levels, the narrow classification of students in terms of ability may become less essential and, possibly, even counterproductive.

The purpose of this historical view has been to show that grouping students on the basis of ability and age, modifying the curriculum, and altering time are part of a larger package established to meet the needs of students who differ greatly in learning. It can be seen that the practice of ability grouping arose from a converging set of circumstances. Only after it was first implemented was research undertaken to evaluate its effectiveness.

RESEARCH ON ABILITY GROUPING

Researchers since the early decades of the century have inquired about the consequences of ability grouping for the learning and feelings of students. The typical study compares the learning of students who are grouped in some fashion on the basis of ability or achievement with comparable students who receive instruction in more heterogeneous groups. Although other interesting questions have also been pursued, such as the extent to which ability grouping really decreases diversity within classes (Burr, 1931; Hartill, 1936; West, 1933), the main emphasis has been on studying the impact of grouping on achievement.

The literature contains two major waves of reviews: one in the early 1930s (Billet, 1932; Kelliher, 1931; Miller & Otto, 1930; Rock, 1929; Whipple, 1936; Wyndham, 1934) and another in the 1960s (Eash, 1961; Ekstrom, 1961; Goldberg, Passow, & Justman, 1966; Goodlad, 1960; Morgenstern, 1966; Yates, 1966). The reviewers of both periods criticized the adequacy of the studies they reviewed and emphasized the inconsistency in results. The early reviewers were, however, unique in their conclusion that ability grouping benefited "slow" pupils. As Otto (1941) states, "The evidence indicates greatest relative effectiveness for dull children, next greatest for average children, and least (frequently harmful) for bright children" (p. 440).

In contrast, reviewers of the 1960s discerned a tendency for high achievers in homogeneous groups to learn more than comparable students in heterogeneous groups, but for low achievers to do less well in homogeneous than in heterogeneous groups (Borg, 1965; Dahllöf, 1971; Esposito, 1973; Findley & Bryan, 1971; Heathers, 1969).

For the first time, the equivocal results were used to assert that there is little positive justification for segregating students according to achievement or ability (Eash, 1961; Esposito, 1973; Findley & Bryan, 1970; Yates, 1966).

These differences may reflect biases on the part of researchers and reviewers from the two respective times, with those from the 1920s and 1930s being more optimistic about the effects of well-matched instruction, whereas those from the later period, more aware of the potential harm of segregated instruction. The early results might also have arisen in part from the extreme difficulty of the curricula of the time. Ayres in his book, *Laggards in Our Schools*, published in 1909, for example, expressed the belief that courses in the curriculum were "not fitted for the average child."

More recently, meta-analyses of the results from the grouping studies have emerged (Kulik & Kulik, 1982; Noland, 1985; Slavin, 1987). The one that I have found most useful is the meta-analysis combined with narrative review undertaken by Slavin (1987). I like this analysis for several reasons. The results are reported for each study separately, and distinctions are made concerning the subject area of focus, either reading or mathematics, and the grade level of students. For reading specialists, it is important to know which results are based on reading measures and the grade levels from which they were derived.

Equally important, the findings are organized in terms of the forms of grouping frequently employed in elementary schools. Instead of mixing all forms of grouping together as had been done in most previous reviews, Slavin's distinguishes the major forms of grouping between classes from those within classes. As shown in Figure 1, *grouping within classes* involves the placement of students into small groups within classes on the basis of reading achievement. *Grouping between classes* is the other common form of ability grouping and refers to the assignment of students to classes or tracks on the basis of ability or achievement. Variants of between class grouping include grouping into classes on the basis of achievement, and regrouping for reading instruction across classes within one grade or between grades (cross-grade grouping).

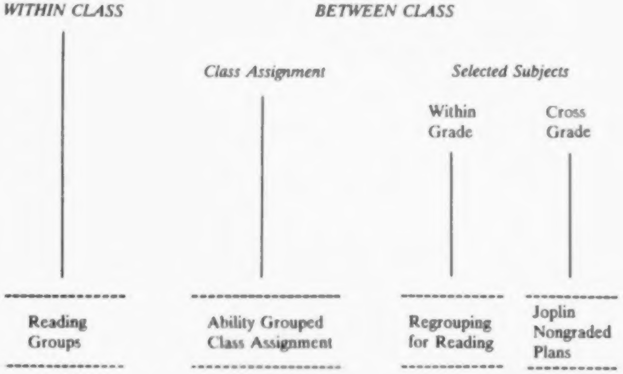

Figure 1. Typology of elementary school ability grouping.

Both ability grouping practices emerged as practical solutions to the problem of how diverse groups of similarly aged students should be organized so that knowledge could be imparted.

With respect to ability grouping within classes and based on the studies meeting the criteria for inclusion in his analysis, Slavin found no studies that compared students' learning in small ability groups within classes with those receiving total class instruction in nonability grouped classes. Thus, he found no basis for evaluating this practice in reading. Although there are studies of total class instruction in reading, these occur in classes formed on the basis of achievement through regrouping. (Though results showing the advantages of ability grouping within classes were reported for math instruction, it is not clear that these apply to reading.)

With respect to ability grouping between classes and, again, based on the studies meeting his criteria, Slavin found that ability-grouped class assignment did not result in enhanced learning. Further, there was no support for the assertion that high achievers benefit from being placed in homogeneous ability classes or that low achievers suffer from it. Similarly, Slavin found no advantage for regrouping students for reading instruction across classes within grade levels. These results largely agree with the inconsistent findings reported by earlier reviewers.

More controversial, Slavin found that students grouped for reading instruction across grade levels learned more than comparable students in self-contained classrooms in 9 of the 11 studies involving reading instruction. Two of the studies with appropriately matched samples also reported results for subgroups; both lower achieving and higher achieving students were found to have learned more when instructed in cross-grade groups than similar students instructed in self-contained classrooms.

It is possible to explain these results in terms of the greater appropriateness of instruction made possible through using the curricular materials from several grade levels and from the fact that the regrouped classes typically had fewer groups within classes for reading instruction and consequently more time for direct instruction and supervision. Although these explanations are plausible, they divert us from the real point. A review can be no better than the research studies it summarizes. The main point to be drawn about this entire body of research, including the studies in the Slavin analysis, is that a social arrangement, in and of itself, does not lead directly to achievement or attitudinal outcomes. Rather, it is the activities and knowledge that students experience as part of instruction that bear directly on what they learn and how they feel about their learning.

We should have learned from this long history of research that we need to document in a systematic way the instruction that intervenes between a grouping arrangement and learning. Only then can we begin to understand how group composition sets outer limits on what can occur during instruction. It is not surprising that when unspecified or poorly specified instructional programs intervene between group structure and learning, the results, for the most part, are inconsistent, and when consistent, they fail to reveal the mechanism that accounts for higher achievement. Thus, to my mind, the conclusions from reviews of the extant grouping literature that simply compare grouped and ungrouped students without regard to the instruction should not be taken seriously.

RECENT STUDIES OF READING GROUPS

Research of the most recent period, undertaken mainly by sociologists, is unique in its examination of grouping more broadly conceived and in its focus on the instruction that ability groups receive. Concern with equality spawned several lines of inquiry, some going beyond narrow ideological concerns and leading to conceptualizations of ability grouping as part of the social systems of classrooms. Some of the research stems from concern with the mechanisms through which social background influences education and life chances (Cohen, 1984, 1986; Rosenholtz & Cohen, 1983). Other researchers focus more directly on the interconnections between student characteristics, instructional grouping, curriculum and its presentation, and learning (Barr & Dreeben, 1983; Dahllof, 1971; Dreeben & Gamoran, 1986; Gamoran, 1986; Hallinan & Sorensen, 1983; Sorensen & Hallinan, 1986).

Of particular interest to reading researchers, the question that has received most attention concerns instruction: Once students are placed in ability groups for reading, does this placement influence the quality of their instruction? Does the instruction of ability groups differ, and if so, how? A body of recent naturalistic research has compared the social participation and academic task characteristics of high and low reading groups (Allington, 1983; Barr, 1989; Hiebert, 1983; Good & Marshall, 1984). Although groups are composed to facilitate differential instruction, the question is whether different instruction constitutes effective instruction. Rist (1970) conducted one of the earliest ethnographic studies of ability groups. Beginning in kindergarten and following students through first and second grades, he found that the groups he observed were treated differently. Children in the low status groups communicated less with the teacher, were less involved in class activities, and received infrequent instruction in comparison with high status children.

Other research has documented the differential treatment of "low" and "high" reading groups. McDermott (1976), in his study of instruction in a first-grade class, found that low group children spent less time on reading instruction than high ones partly because their turn-taking procedures diverted attention from the instructional task and because of frequent interruptions by other class members. McDermott suggests that the agendas for the two groups may differ, with the low group avoiding the frustration and embarrassment associated with getting through the reading lesson. Others have reported that the instruction of low group members tends to be characterized by a greater number of intrusions (Eder, 1981, 1982), less time (Hunter, 1978), and less time-on-task (Gambrell, 1984; Gambrell, Wilson, & Gnatt, 1981; Good & Beckerman, 1978; Haskins, Walden, & Ramey, 1983; Martin & Evertson, 1980). In contrast to these findings, however, some have not found differential time allocations (Collins, 1986; Weinstein, 1976).

Beyond characterizations of instructional time, other researchers have focused on the work of low and high groups. Low group members typically read less material and complete simpler assignments (Allington, 1984; Barr, 1974, 1975; Barr & Dreeben, 1983; Clay, 1967; Hart, 1982), focus on smaller units of print and have decoding rather than meaning emphasized (Allington, 1980; Alpert, 1974; DeStefano, Pepinsky, & Sanders, 1982; Duffy & Anderson, 1981; Hart, 1982), are given more drill, skillwork and oral reading (Collins, 1986; DeStephano, Pepinsky, & Sanders, 1982; Haskins, Walden, & Ramey, 1983), are asked more questions that require recall of information rather than reasoning (Seltzer, 1975), receive different prompts from teachers (Allington, 1980; Hoffman & Baker, 1981), and are provided more structure through the provision of advanced organizers for lessons and motivational exercises (Duffy & Anderson, 1981; Hart, 1982; Russo, 1978) than are students in higher achieving groups.

It is typically concluded on the basis of this evidence that low group members are being treated unfairly. Some observers go further to conclude that their instruction is causing them to be poor readers. But there are problems in drawing such conclusions. First, few of the case studies describe the learning of students in a systematic fashion, and without outcome measures it is difficult to judge the consequence of instruction for learning. Second, there are no appropriate instructional contrasts on which to base conclusions; low groups need to receive and respond positively to the same kind of instruction as high group members before it can be concluded that the same treatment is appropriate. It is, however, reasonable to conclude, based on the findings, that low group members receive different and inferior instruction in comparison with that of high group members.

Although I accept this conclusion, I also want to suggest an alternative. Out of our concern for the lower reading proficiency developed by low group members, I believe that we have focused on differences to demonstrate inequality. This focus, however, has blinded us to the important similarities that characterize the instruction of both low and high group members. First, it is well documented that most elementary school students learn from basal programs; both low and high groups read the same stories and participate in many of the same instructional activities. Although one may argue that the pace of instruction differs, even this is not really true after the first 6 months of instruction. The first-grade instructional studies that I have undertaken with Robert Dreeben show, for example, that low group members proceed at a faster pace than high group members when they read the same stories later during first grade that were read by the high groups earlier in the year. We found similar findings in our study of fourth-grade groups (Barr & Sadow, 1989). As shown in Figure 2, low groups read the same or more levels from the basal than do average and high groups.

Indeed, the results for these groups are fairly characteristic of those in most schools I have worked with: The low groups proceed about a half year behind and the high group about a half grade ahead of the average groups. Thus, differences that come about during the first half of first grade establish the difference that continues to exist between high and low groups during the remainder of elementary schooling. When I work with teachers in schools, we often map the basal placement of their reading groups; all but a few lower achieving individuals are included in our mapping. I have represented the typical pattern of instruction in Figure 3, with line A representing the high group, line B representing the average group, and line C representing the low group. Note that I say *pattern of instruction* rather than *pattern of learning*. The variation in learning (reading proficiency) is wider than in instruction—although how much wider is difficult to determine given the way our standardized tests are designed.

One thing that becomes clear from examining Figure 3 is that the difference between low and high group members is really minor. In other words, we choose to label students through membership in low and high groups, but then we proceed to

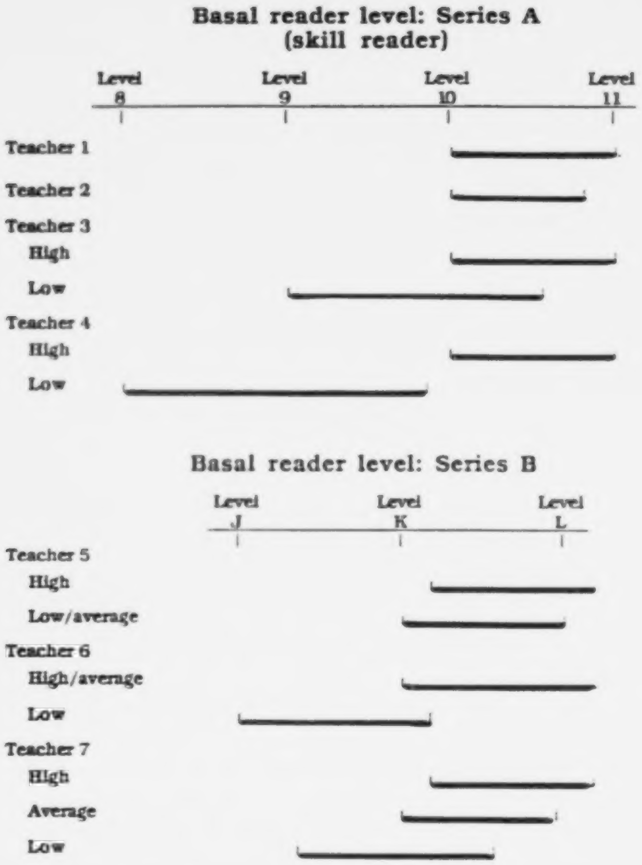

Figure 2. Histogram of levels of basal materials read by reading groups.

offer them instruction that is essentially the same. It would seem that we should either instruct all students with the same materials, offering differential support as necessary, *or* truly individualize instruction so that along with the label of low group member, major benefits are realized through greater instructional support.

FUTURE RESEARCH

As in any period when such a long-standing practice as ability grouping is reexamined, research efforts are stimulated to evaluate the effectiveness of alternatives. Investigators are beginning to focus on the instruction of groups that are heterogeneous in ability. As an example, Eldredge and Butterfield (1984, 1986) compared second graders instructed in heterogeneous groups with those using a traditional basal in-

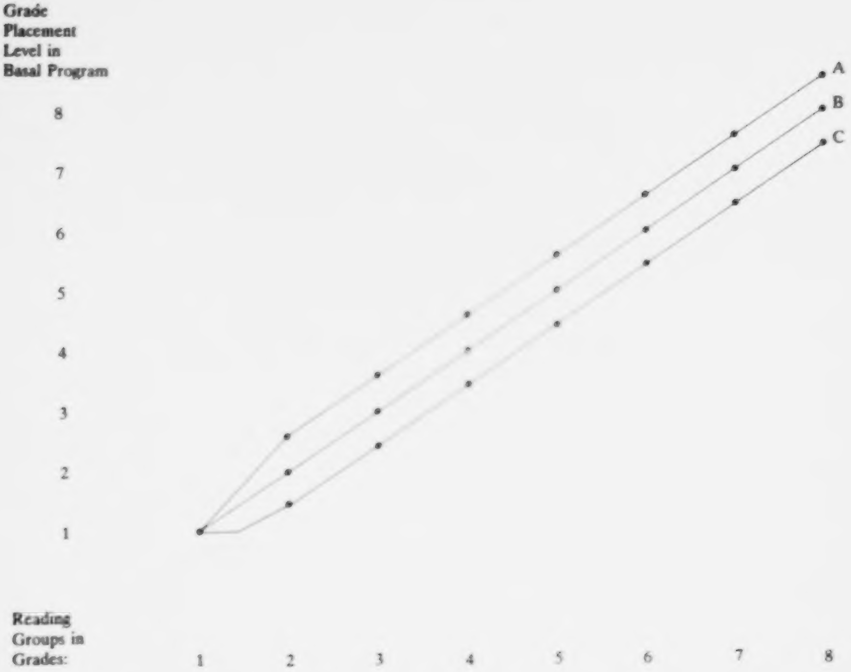

Figure 3. Representation of the instructional levels of groups in the basal reading program from Grades 1 to 8.

structed in ability groups. The same reading selections were used for all students in the experimental classes; consequently, the method of instruction needed to be modified to involve peer-supported oral reading for the poorer readers. The results showed no achievement or attitudinal differences for the two groups; the equivalent results suggest that heterogeneous grouping will not interfere with the progress of young readers (i.e., second graders). Unfortunately, results were not analyzed for students of different ability to compare low ability students in the two grouping situations.

Studies involving cooperative peer groups as part of reading instruction also show that learning to read is not impaired by using heterogeneous forms of grouping, and that it is often enhanced (Rosenholtz & Cohen, 1983; Stevens, Madden, Slavin, & Farnish, 1987). Further, none of the experimental studies reviewed by Slavin (1983) found that learning was depressed by peer group work. Indeed, the three involving reading tasks (DeVries, Mescon & Shackman, 1975; Hamblin, Hathaway, & Wodarski, 1971; Slavin & Karweit, 1981) all showed higher achievement for students working in peer groups than individually. The results from these experimental studies need to be further tested for classroom reading instruction over the course of the school year.

As part of the continuing research on alternative forms of grouping, it is important that the instruction students receive—the materials they read and the strategies developed by teachers—be described. The question that needs to be pursued is how the compositional characteristics of groups influence or limit the instruction experienced by students, which in turn influences their learning.

My own research is proceeding in a somewhat different direction—that of trying to learn still more about reading instruction that involves ability groups. In particular, I am concerned with the composition of reading groups in relation to the instruction they receive. While examining the instruction of groups in 7 fourth-grade classes, I made an interesting discovery: The regrouped classes in one school were extremely similar in reading comprehension as measured by the *Degrees of Reading Power* test. These two classes are shown in Figure 4 as Teacher 1 and Teacher 2 in District A. As I looked further I found that the teachers who ability grouped within classes also had groups which were highly overlapping in reading comprehension. For example, note the high and low groups in Teacher 3's class. Teachers 5 and 6 formed four groups between them. With the exception of the outlier in the low group, their groups are also highly overlapping in composition. The same is true for the three groups in Teacher 7's class. Only Teacher 4 established extremely different, nonoverlapping groups. These findings show that there were many strong comprehenders in the low groups and many poor comprehenders in the high groups.

My first response to this evidence was one of amazement; but then with further reflection on the nature of reading, it appeared obvious. It seemed quite possible that the groupings, originally established in the primary grades on the basis of decoding skills, were perpetuated into the intermediate grades where comprehension and background knowledge are more important. Since decoding skill and listening comprehension are only moderately correlated, it might be anticipated that groups would become more diverse in comprehension as members became fluent readers. Clearly, this set of findings will need confirmation in other classes, but it does raise questions about ability groups in the intermediate grades. We are labeling students through our grouping procedures as poor readers who are, in fact, good comprehenders. More important, I believe, this evidence shows that fourth-grade teachers are able to teach groups which are diverse in comprehension.

The question that follows is: Do we really need ability groups in the intermediate grades once children have become fluent readers? With the evidence that teachers are currently instructing groups that are diverse in comprehension in the intermediate grades, at least we know that it is possible. Recent research suggests that alternative forms of grouping such as total class instruction, followed by small group support for those who need it or by heterogeneous peer group work lend themselves to strategy development and are effective in increasing comprehension (Barr, 1987; Stevens, Madden, Slavin, & Farnish, 1987).

Others may extend the question: Do we need ability groups at all in reading? I am not sure about the answer to this question either. Studies such as that by Eldredge and Butterfield (1984, 1986) suggest that it is possible to teach reading without ability groups as early as second grade if reading materials and instructional methods are modified. But more evidence is needed, particularly that pertaining to the learning of lower achieving readers.

In sum, there is a clear need for more research on elementary grade reading that examines group characteristics in relation to instruction, achievement, and attitudinal outcomes. Most past research has examined either group characteristics in relation to

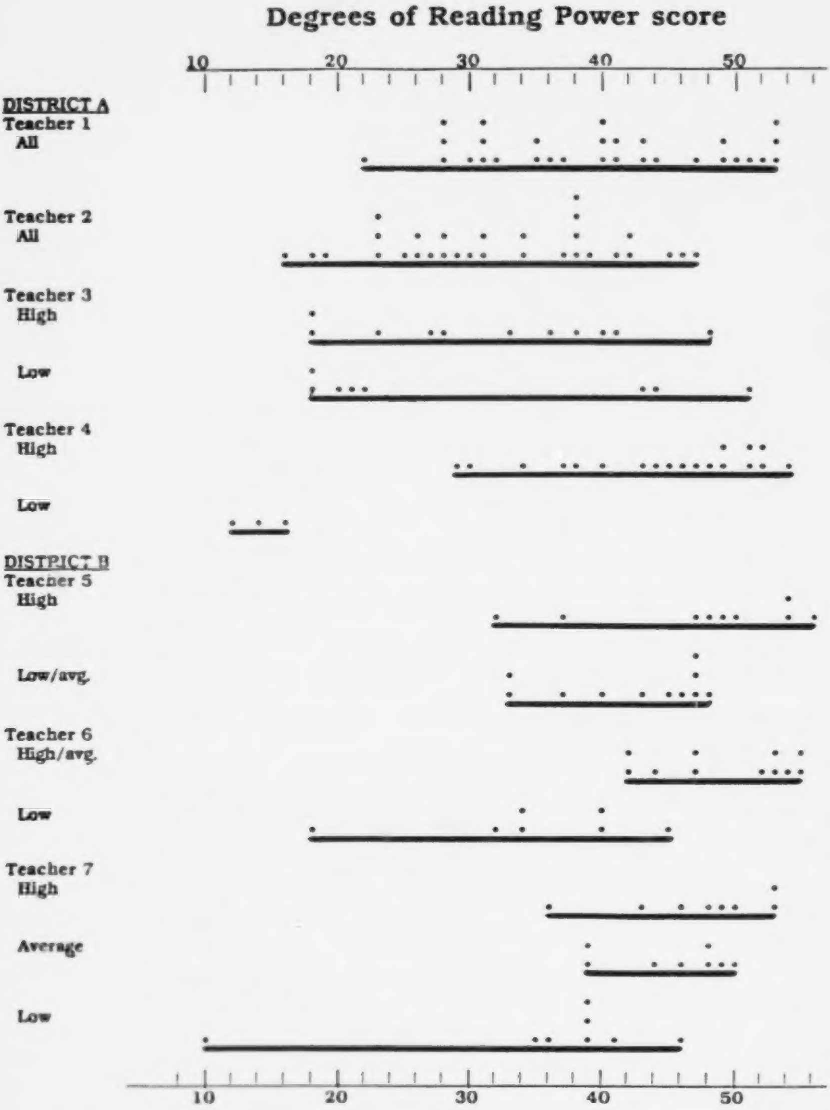

Figure 4. Histogram of mean percentile rank comprehension scores on Degrees of Reading Power Test for reading groups.

outcomes or group characteristics in relation to instruction; neither provides a comprehensive basis for understanding the consequence of ability grouping or any form of grouping. Until all three components are examined in the same study, we have little basis for evaluating the conditions under which ability grouping may be advantageous or destructive.

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DESIGNING INVITATIONS TO THINKING: SOME INITIAL THOUGHTS

John Bransford, Charles Kinzer, Victoria Risko, Deborah Rowe, and Nancy Vye
George Peabody College of Vanderbilt University

This paper provides an overview of some of the issues that John Bransford discussed during his invited address at the National Reading Conference meeting in December, 1988. The address focused on several projects being conducted by members of Vanderbilt's Learning Technology Center. The major goal of the NRC presentation was to illustrate ways in which new technologies permit us to go beyond the typical lecture, text, and workbook approach to education. Thanks to sophisticated computer graphics plus the invention of videotape, and especially videodisc technology, it has become possible to design multimedia approaches to education, where multimedia includes the ability to combine dynamic, visual information (e.g., moving scenes) with oral language and print.

We share with many others the belief that the invention of technologies for combining visual information with text represents an important landmark in human history (e.g., Pea & Soloway, 1987). An earlier milestone was the invention of written language. With it, humans achieved the ability to capture information and transport it across time and space. Written language also allows one to return to any segment and reread. This permits contemplation and analysis, including the ability to debug previous comprehension errors.

With videotape, we can now capture linguistic expression *plus* visual and auditory information, such as the facial expressions, auditory inflections, and environmental context of the person speaking. With introduction of computer-controlled, random access videotapes and videodiscs, we also have the ability to return almost instantly to any segment and re-view the events (Bransford, Hasselbring et al., 1988; Kinzer, 1989). This permits experiences that could have powerful effects on learning and cognitive development. One major goal of our center's research is to explore some of these possible effects.

VIDEO FROM THE PERSPECTIVE OF "THE COMPETITION"

Imagine a third grader on a Saturday morning who is given the option of watching television or reading a book. In our experiences with our children, when we give them a choice, the television option usually wins. A book may be favored if we take the time to read it with our children; if we are busy, however, television is usually more inviting.

If you spend time on Saturday morning watching TV, you will see some reasons for our children's choices. The shows are action-packed and fast-paced. Topics and settings change rapidly, so there is little time to become bored with a scene. Even the commercials are engaging. An example of an interesting Saturday morning show is *Hey Verne, It's Ernest*. In one show, the actor Jim Varney plays (a) Ernest who is trying to win a baking contest; (b) an infant in a crib; (c) a woman in a restaurant ordering frog's legs. In these scenes and others, there are many levels of humor. Children of different ages, and even adults, can find something of interest in the videos.

At the NRC conference we emphasized that the art of creating engaging videos has developed considerably during the past several decades. We showed clips of old commercials and advertisements illustrating that these were different from the video segments we see today. Today's rock videos, commercials, and children's shows are extremely engaging and fast moving. One can easily become mesmerized while watching, and it takes little thinking to follow them. As competitors for our childrens' time and attention, today's entertainment videos are difficult to beat.

The talent involved in creating today's videos is striking. An important goal for educational researchers and designers is to combine the talent of people in the video arts with the talent of people who know how to foster and assess learning. To do this, we need some indication that video can do something other than mesmerize and entertain.

BENEFITS OF VISUAL PRESENTATION

While we can view video technologies from the perspective of the "bad guy" who competes for our childrens' time and attention, clearly, video technologies can wear a white hat as well.

Helping Young Children Who Are At Risk of School Failure

Johnson's (1987) research illustrates the potential power of video technologies for learning. His study was based on the premise that language is a powerful tool only when language comprehenders can use their knowledge to fill in gaps in messages (Anderson, 1984: Bransford, 1984). He compared the retelling and comprehension performance of 4- and 5-year-old inner-city children. One group was told a simplified version of a portion of the *Swiss Family Robinson* story and the other was shown a videodisc (Annakin, 1960) of the same part of that story. Retelling scores for children in the videodisc groups were substantially higher—four times higher for 4-year-olds and twice as high for 5-year-olds. Similar results occurred on the tests of comprehension. Being able to see events, as well as hear about them, had a positive effect on the children.

Johnson also attempted to teach the children what it means to understand a story so they would know when they had adequately comprehended and when they had not.

Again, he compared the results of working with the children in a purely verbal mode with that of using a videodisc and the rapid access it provides. The videodisc group learned far more. In fact, the posttest retelling scores for the verbal group never reached the pretest level of retelling scores for the visual group (after the visual group's viewing but before instruction). The addition of a visual context gave them a great advantage.

The results of Johnson's study are highly encouraging. We had expected to see differences in favor of the video group but they were much larger than we had anticipated. We do not always expect such large differences between video-based and text-based presentations. In our view, the magnitude of the video advantage depends on the degree to which the text presupposes knowledge that the students have not yet acquired (e.g., Anderson, 1984; Anderson & Pearson, 1984; Bransford, 1984).

There is a potential danger in Johnson's work, however. Video technology could be used in a way that takes time away from literacy activities if it is used inappropriately. Johnson's goal is to use the video as a tool for eventually enhancing reading comprehension. For example, one can imagine presenting preschool students with verbal stories of people stranded in space and helping them understand how this story is analogous to the *Swiss Family* story. The richer the understanding of the *Swiss Family* situation, the easier it should be to help students use it as a basis for comprehending new, analogous events. Research is needed to assess the value of first beginning with a rich, contexualized base of knowledge and then using it to help students understand subsequent stories that are read to them.

Facilitating Problem Comprehension

Video technology has also proven useful in helping students understand mathematical word problems. In our mathematical problem-solving project, project staff have been working with fifth and sixth graders who are approximately 1½ years behind their peers in math.

Consider a simple problem using a standard to make a measurement:

> Pete is standing in front of a building that is 8 times as tall as he is. Pete is 16 years old and 6 feet tall. How tall is the building?

Readers of this paper will find this problem easy to solve. It is not difficult to imagine the boy and the building and the height relationship between them. It is also obvious that the boy's age is irrelevant to the problem and can be ignored.

For our math-delayed students, measurement problems are anything but easy. One of the reasons seems to be their lack of attempt to comprehend the problem. It is relatively rare for our students to focus on problem goals (i.e., "How tall is the building?") Instead, they tend to look for numbers and then decide—often by finding a key word such as "how many" or "times"—whether to add, substract, multiply, or divide. In our pretests, almost every math-delayed student used all the numbers in each problem even though some were irrelevant.

Our work with the learning-delayed students suggested the need to design a learning environment that helped them get a better idea of what they were doing and why. We wanted to create a broad-scale environment (a macrocontext) that allowed us to specify an overall goal (e.g., planning for a trip) and then help students view individual problems as subgoals to be reached on route to the overall goal. We have worked with several different videobased environments to discover the design principles that make them work.

For our initial problem-solving environment we used the first 12 minutes of the film *Raiders of the Lost Ark* (Spielberg, 1981) presented on videodisc (see Bransford, Hasselbring et al., 1988). This segment enabled us to formulate the following goal: One might want to return to the jungle to explore the region or to get the golden gong that Indiana Jones left behind. If so, it could be important to know dimensions of obstacles such as the size of the pit one would have to jump, the height of the cave, the width of the river and its relationship to the size of the seaplane, and so on. Since this information is on film, it does no good to measure sizes directly (e.g., the pit is only several inches wide on the screen). However, one can use known standards (e.g., Indiana Jones) to estimate sizes and distances that are important to know.

The general goal of learning more about important dimensions of potential obstacles guided the selection of mathematics based problems that were formulated from scenes in this segment. Through the use of random access videodisc we were able to isolate and quickly access the sequence of frames that specified each problem situation. For example, at one point Indiana comes to a pit and attempts to get over it. He jumps. How wide is the pit? Could humans possibly jump something that wide?

The width of the pit can be estimated by finding another, earlier scene where Indiana uses his bullwhip to swing over the pit. Through videodisc freeze frame we are able to show a scene of Indiana swinging and extending halfway across the pit. Measurement on the screen (either by hand or through the use of computer graphics) allows students to see that the pit is two Indianas wide. If Indiana is 6 feet tall, the pit is 12 feet wide. Students can be helped to determine this information themselves and, subsequently, to see if they could jump something that was 12 feet wide.

In our initial studies, the problems we worked with involved finding the length or width of an object given its proportional relationship to a standard of known length or width. Our aim was to facilitate children's comprehension of the problem situations, motivate them to solve various problems, and increase their understanding of the relation between the known and unknown quantities expressed in the problems. The video provided an especially rich macrocontext from which to begin and was supplemented with effective teaching. Students were encouraged to create symbolic representations of problems and then received individualized feedback about the strength and weaknesses of their approach to each problem. All instruction was one-on-one.

The results of the experiment were very encouraging (Bransford, Hasselbring et al., 1988). Students in a control condition received teaching that was similar to, and perhaps an improvement on, the teaching they received in school. For example, in one-on-one sessions that included a great deal of encouragement, students in the control group worked on problems and were shown correct solution strategies after attempting to solve each problem. Nevertheless, after more than a week of instruction, there was almost no improvement from pretest to posttest. In contrast, the improvement for students who received instruction in the context of the video was impressive. This improvement was not only for problems that referred to the Indiana Jones context, it worked for out-of-context problems as well. We also have observed students who received video instruction spontaneously using what they learned in class to better understand their outside environment; they used themselves and their friends as standards to measure the height of trees, buildings and so forth (see Bransford, Sherwood, & Hasselbring, 1988).

Beyond Raiders. The first 12 minutes of *Raiders of the Lost Ark* is an exciting adventure with lots of opportunities for instruction (for science instruction in this context, see Sherwood, Kinzer, Bransford & Franks, 1987). Nevertheless, it was not made explicitly for educational purposes and hence has limitations. For example, assume that Indiana Jones runs at a speed of 6 miles per hour and we want to time his running to measure distance. This is, in fact, impossible. There are too many edits in the film, so the time estimate does not yield a valid estimate of distance.

Because of such limitations, we have created our own videodiscs that provide a context for learning about the importance of mathematical thinking to plan for various situations. Results obtained with our amateur quality *River Adventure* videodisc are reported in Barron, Bransford, Kulewicz, and Hasselbring (1989) and Furman et al. (1989). We have also produced a professional quality disc, *The Adventures of Jasper Woodbury* (Sturdevant, 1988), that provides a context for teaching problem-finding as well as problem-solving. The quantitative thinking required to solve the problems requires pre-algebra concepts in mathematics. *Jasper* also provides a context for linking information relevant to science, history, and other areas. We are just beginning to use this disc in school-based research projects, but preliminary data show that both students and teachers find it valuable and enjoy it very much. Preliminary studies confirm the need to help students develop problem-finding skills. We have found that even students who are able to *solve* the *Jasper* problems often cannot *identify or formulate* these same problems (Vye et al., 1989).

Facilitating Vocabulary Acquisition

Third, video technologies can be used to teach new vocabulary. George Miller (personal communication, April 28, 1986) tells a story that illustrates advantages that video technologies can play in classrooms. In this case students were to look up new words in a dictionary and use each in a sentence. One student looked up the word "erode" and wrote: "Our family likes to erode on weekends." Miller felt the student had not been paying attention, so he asked him to look up the word again. The student did, and indicated that he was correct the first time. The student pointed to one of the meanings of "erode" as "to eat away."

Clear visual representations of events can facilitate comprehension of new concepts. The concept of "erode" could be shown taking place over time. Concepts such as "acceleration" and "constant velocity" can be contrasted on film. For young children, ocean waves and large sailing ships can be conveyed in videos such as *Swiss Family Robinson*. In many ways, the video can substitute for the everyday perceptions available to children. It certainly seems that early vocabulary acquisition is heavily dependent on the multimedia nature of the experiences that children enjoy (e.g., Bransford & Heldmeyer, 1983; Chapman, 1978; McNamara, 1972).

In a project conducted with IBM, we created an interactive videodisc program that illustrates "new approaches to learning vocabulary." The program is currently at the

Museum of Science and Industry in Chicago. Part of this interactive program includes video for explaining words such as *ubiquitous, anthropomorphic, nonplussed,* and others. One of the video segments we showed at the NRC conference involved a first grader, Ashley, who was asked to explain the meaning of "anger," "love" and then "ubiquitous" after exposure to the videodisc program. Her reaction time for defining *ubiquitous* was faster than for the other two words, and she easily gave examples that fit the definition. The presence of the video can make normally difficult words quite easy for the children to learn.

Our initial interpretation of success with Ashley and other young children was that the video was much less ambiguous than a mere verbal definition. We tested this in several studies with fifth graders. Some students were given typical verbal instruction that involved definitions and the use of each concept in a sentence. Other students saw video in conjunction with the verbal instruction. To our surprise, there were absolutely no differences between the video and the verbal groups. After some reflection prompted by the unexpected data, it became clear what the video had really done for us and the students. It had served as a shared context that was easy to remember and that could be referred to during the course of our interactions. For example, we might say to students, or they to us, "Remember that scene of the guy talking to the lawnmower? What was the word they were illustrating?" (i.e., anthropomorphic).

Intuitively, it was easier to remember the visual scenes than to remember sentence contexts that were provided verbally. Therefore, the benefit of video might be in its ability to set the stage for further practice. We tested this in several studies and found that our intuitions were correct. The ability to remember video scenes was especially powerful when they came from a thematically related context such as *Raiders of the Lost Ark* or *Swiss Family Robinson.* We also found that teachers intuitively referred back to the videos during the course of the school day and week, providing the kind of practice that facilitated vocabulary acquisition. Overall, the idea of the video as providing a *shared context for mediation* (instruction) is one of the keys to the approach to instruction we are developing.

ANCHORED INSTRUCTION

We call our developing approach to instruction *anchored instruction* (Bransford, Vye, Kinzer, & Risko, in press). At the heart of anchored instruction is use of computers and videodiscs to create rich problem-solving environments that serve as shared contexts for exploration and discussion. Ideally, anchored instruction (a) involves a problem-oriented approach to instruction; (b) involves sustained thinking, often in groups, about problems; (c) permits students to integrate skills and knowledge that in normal curricula remain disconnected; and (d) does not presuppose extensive background knowledge.

At the heart of our approach is an emphasis on the importance of creating an anchor or focus (e.g., a videodisc or computer simulation) that enables students to identify and define problems and to pay attention to their own perception and comprehension of these. They can then be introduced to information relevant to their anchored perceptions. *A major goal of anchored instruction is to let students experience the*

changes in their perception and understanding of the anchor as they see the situation from multiple points of view.

Theorists such as Dewey (1933) and N. R. Hanson (1970) note that the experience of changes in perceiving and understanding is common to experts in a discipline who have been immersed in phenomena and are familiar with how they have been thinking about them. When introduced to new theories, concepts, and principles, they experience the changes in their own thinking that these ideas afford (this also allows them to elaborate on and evaluate the new information). For novices, however, the introduction of concepts and theories often seems like the mere introduction of new facts to be memorized. Since the novices have not been immersed in the phenomena, they are unable to experience how the new information can change what they notice and understand.

Varieties of Anchors

The general idea of anchored instruction has a long history. Dewey discussed the advantages of theme-based learning (many current curriculum designers claim to use this but use only superficial themes). In the 1940s, Gragg (1940) argued for the advantages of case-based approaches to instruction. Both Dewey and Gragg focused on verbally based anchors. Our projects involve videodisc-based anchors (see also Spiro, Vispoel, Schmitz, Somarapungavan, & Boerger, in press).

One advantage of using videos is that students, at a point in their development where they are behind their peers in reading skills, are able to gain access to information that forms the basis of class discussions. These videos also contain much richer sources of information than are available in the printed media and in programs with limited graphics. Gestures, affective states, scenes of towns, music, and so forth, accompany the dialogue. Therefore, there is much more to notice. This increase in opportunities for noticing is especially important for increasing the possibility of finding relevant issues embedded in the video; it provides an opportunity to encourage problem-finding and problem representation (Bransford & Stein, 1984) rather than providing preset problems to students. In addition, the richness of information to be noticed increases the opportunity to help students appreciate how their perceptions and comprehension change as they are helped to see the video from multiple points of view. Finally, the availability of video on disc makes it possible for students to create multimedia presentations, greatly increasing the interest of peers, teachers, and parents (Bransford, Goin et al., 1988).

The Importance of Multiple Perspectives

A special advantage of anchored instruction is the experience of thinking about the same situation from a variety of perspectives. For example, consider a problem such as finding ways to reduce the number of bruises on tomatoes. As suggested by Adams (1979), an engineer might attempt to make mechanical tomato pickers less likely to bruise tomatoes. A transportation expert might try to find ways to protect tomatoes during shipping; a biologist might create a strain of tomatoes that are less likely to be bruised. A fourth approach might be to develop an extremely fast-growing tomato seed that can be shipped directly to consumers. The ability to take multiple perspectives on a problem (to define it from a variety of perspectives) is an especially important aspect of problem solving (e.g., Bransford & Stein, 1984). Different ways of presenting information affect the probability that students will spontaneously see new problems from multiple points of view (Bransford et al., in press).

Related to the importance of multiple perspectives is the importance of helping students see how different ideas—especially ideas from different content areas—each can play a role in thinking about an area. Most existing curricula do not permit such experiences. In many basal readers, for example, students are introduced to different components of story grammars, each in a different story rather than in a single one. Similarly, in many attempts to teach learning and problem-solving skills, different components (e.g., how to memorize, to categorize, to compare, etc.) are taught in the context of different examples and different instructional modes. At a general level, existing curricula are organized so that science, mathematics, reading, writing, and so forth all tend to be taught in different contexts rather than integrated into single contexts. One of the advantages of anchored instruction is the opportunity it provides to help students see how concepts from traditionally different context areas (e.g., science, mathematics, history) all apply to the same "slice of life" (Bransford, Hasselbring et al., 1988).

A set of multiple-perspective experiences that are particularly interesting to people involves the opportunity to see differences in what experts versus novices notice about various segments of video. At the NRC conference we showed several video segments of people who were experts in particular areas. All were able to notice features on the video that were not noticed by novices. One example was the differences between an expert and novice at football. Our expert was extremely good at identifying a number of specific events that took place in the short football segments she was shown. Our novice had much more difficulty, although she knew a lot of football vocabulary and hence could talk about quarterbacks, linebackers, and so on. However when faced with the challenge of identifying what happened in the football segments, she had difficulty. In contrast, in areas such as dance and computer programming she is excellent at noticing subtleties that others frequently miss.

THE YOUNG SHERLOCK PROJECT

The idea of anchored instruction is illustrated by our "Young Sherlock" project, which has been in place in two fifth-grade classrooms during the past 1½ years. We are working with teachers and their classes of below-average and average ability students for several class periods that total approximately 4 hours each week.

The major anchors for our "Young Sherlock" project are the videos (on disc) *The Young Sherlock Holmes* (Spielberg, 1985) and *Oliver Twist* (Lean, 1948). (*The Young Sherlock Holmes* was the first anchor we used and hence became the name of our project.) Students work with each video over several months, so they get the opportunity for extended thinking about a single domain. We also explore the video from a number of perspectives (literary, historical, scientific), so students get the experience of seeing the same domain from multiple points of view.

Experimental and control groups in our project both receive the same basic content in their instruction; they are both introduced to the same new vocabulary words, taught the same ideas about story structures, and so on. The groups differ with respect to anchoring. In the experimental group, each lesson focuses on some aspect of *Young Sherlock Holmes* or *Oliver Twist*. In the control group, lessons follow the more typical format of focusing on a specific story for 1 or 2 days and then switching to another story, or focusing on one topic (e.g., the industrial revolution in history) and then jumping to another one. Thus they have no long-term macrocontext.

Advantages of A Video Context

The story of *Young Sherlock Holmes* is available as a book (Lerangis, 1985) as well as on video; we chose to use the video as our primary anchor. It is instructive to ask why the book would not provide a more effective anchor. At first glance, the book would be preferable for the development of literacy-related activities. It is useful to consider some of the reasons why this first-glance assumption may not be true.

Communicating complex information. One advantage of the video is the richness of information available for instruction. For example, one of our goals is to teach about stories and their structure. The book on Sherlock, designed for children, provides a much more simplified account of story development than is available in the movie. However, if the book were more complex it would become difficult for many children who are not already good readers. In contrast, the video provides an excellent source that can be analyzed in detail to provide information about stories embedded within stories, and about each story's initiating event.

The preceding arguments can be clarified by considering one aspect of our attempts to help students develop a rich understanding of story structure—character development. Since the book is simplified for children it lacks a great deal in this regard. As an illustration, consider one of the key figures in the story, Dudley. He is an antagonist to Holmes. The following description of Dudley occurs in the book:

> The library clock said 3:20. Holmes was late. As Watson looked about the enormous room in awe, Holmes approached the poets' section. And there was Elizabeth—with another student.
>
> Dudley Babcock turned his well-groomed face toward Holmes and smiled. In his hand was a gold pocket watch.
>
> "Elizabeth was admiring my new timepiece. All the stylish gentlemen are wearing them. I purchased it from one of London's finest jewelers."
>
> "Mmmm. I find that unlikely," said Holmes.
>
> "I beg your pardon!"
>
> "Had you examined the face, you would have discovered its style is distinctly Oriental. Yet this inscription says the exterior was manufactured in Switzerland." He shook the watch. It rattled loudly. "Just as I suspected-the works are obviously Italian in origin. Congratulations, Dudley. Your 'stylish' timepiece is a fraud."
>
> "Keep your opinions to yourself," snapped Dudley as he took back the watch. With great charm, he kissed Elizabeth's hand. "I look forward to resuming our conversation when there is a little more privacy." With that he turned and walked away. (p. 6)

At the NRC conference we showed scenes of Dudley that parallel the preceding description. It became clear that adjectives such as "snapped" and "with great charm" do not come close to capturing Dudley's essence. By showing the video, we could help students understand the importance of character development in more depth. We could also help them learn how to acquire and use vocabulary words (e.g., *pompous*) that develop the character using written descriptions.

Prompts for generating texts. One of the major reasons we prefer to begin with a video illustration rather than a written description is that the video presentations set the stage for *generating* text and language. The experience of seeing scenes and attempting to generate words describing them is different from the experience of reading passages containing these words. As we discuss later, one of the major advantages we are seeing for our videobased instruction over our control group instruction is in the spontaneous use of new vocabulary. The video medium provides a natural context for encouraging students to actively use vocabulary to describe what they see.

Generative advantages of using video rather than a book increase even further when students are encouraged to engage in activities such as acting out favorite scenes from the movie. The library scene with the pompous Dudley is one such favorite. It involves three characters: Dudley, Sherlock, and Elizabeth. The students like to videotape their performance and compare it with the actual movie scene. As they do this, they discover many parts of the dialogue are missing. Often, they also discover the need for more realistic gestures and better stage directions, such as who should stand and move where.

The students' efforts to improve their acting performance provide a natural context for further learning. To recapture more of the dialogue, the need for a written script becomes apparent. To provide directions for gestures and other aspects of acting, descriptive vocabulary must be used (e.g., "you need to hold your head higher to look more pompous," etc.). In both of these examples, students are generating text rather than merely reading it. That is, they are writing out the scripts and generating the appropriate descriptive vocabulary for use as stage directions. These generative activities have many potential advantages over activities that merely invite students to read what someone else has created (e.g., Slamecka & Graff, 1978). Again, one of the expected advantages involves the spontaneous use of new vocabulary and ideas.

Support for Nontraditional learners. A third reason for preferring video over a book is to meet the goal of including everyone in discussions, especially poor readers. Although teachers may encourage everyone to participate, discussions often require knowledge of subject areas that students first must read about to gain the relevant information. If students are considerably behind their peers in reading, they often fail to acquire the knowledge necessary to enter into such discussions.

At the conference we played an excerpt from a class discussion (Rowe, 1987). A girl on the tape was eagerly answering questions and asking further clarifying questions. What was significant was that she was a poor reader and, according to her teachers, rarely entered into discussions in traditionally taught classes. The girl's teachers were surprised and pleased to see her involvement. We have heard similar comments in almost every videodisc study we have conducted: Teachers note that the "nontraditional learners" often come to life. We assume that the video provides access to information that would be hard for the poor-reading students to acquire if they had to limit their access to reading about the information. They, therefore, get the benefit of actively thinking, sharing, and evaluating ideas about topics of class discussions. This seems far better than failing to enter into discussions at all.

We believe the video also can provide a context that motivates students to learn from reading and that helps them generate meaningful goals. When students become interested in a topic from the video, they are encouraged by us and by their peers to read to learn more about it. They, therefore, learn how to find information relevant to a topic and to evaluate whether an article or book they are looking at is relevant to their goals. Too often, the goals in reading are simply to "learn what is in this article." In everyday activities, people generally formulate goals and decide which articles to read to help them achieve these goals.

Some potential advantages of linking reading with video are illustrated by the story of a student who participated in last year's "Young Sherlock project" who had been labeled "learning disabled" by the school system. At the beginning of the project, she rarely participated in class discussions. Eventually, other students began to see this student as the Queen Victoria expert (*Young Sherlock* is set in Victorian England); questions about the queen and her customs were always addressed to this girl. On library trips she continued to read about Queen Victoria and hence to increase her knowledge. The video context provided the girl with her initial motivation to learn about the queen. Furthermore, it is instructive to note that the girl's motivation to become an expert on Queen Victoria was presumably affected by this topic remaining relevant across months of instruction. As new features were noticed in the movie, new aspects of Victoria and her reign became relevant, too. This is one of the advantages of using video as a macrocontext rather than as a microcontext that is changed daily. With a macrocontext, students are afforded the opportunity for sustained thinking about an overall problem area or domain.

Opportunities for Noticing

We noted earlier that a major goal of anchored instruction is to allow people to experience changes in their own noticing and understanding as they are introduced to new information. One finding from the Young Sherlock project that has become salient to us is that, prior to our instruction, students have little idea of how much of a movie they did not notice initially. After a single viewing they can summarize the general plot. However, there are many aspects of the movie they did not notice at all—nor did we, even after repeated viewing. The video macrocontext allows one to continually discover something new.

The experience of not noticing followed by noticing helps students appreciate the importance of perception and pattern recognition in problem solving. They become more appreciative of what it means for people to be "perceptive." The students also become aware of the importance of this in the movie. Sherlock continually notices clues that escape other people's attention. In this sense, Sherlock is like the football expert that we showed at the NRC conference. Our students readily adopt the notion that "being perceptive" is a very important part of being an effective problem solver. They spontaneously use the word in many of their discussions in class.

There are additional patterns that our instruction is designed to help students notice. A number of these focus on the story structure of the movie. Was it a first or third person narrative? Is the structure of the movie similar to the structure of Conan Doyle's Sherlock stories? What are the subplots in the story (there are several), and what are the initiating events and reactions for each of them? Students can find clues on the disc that help them answer these questions. As they do so, new features of the film become noticed that were not noticed before.

Students also begin to notice features that we did not think about before designing the instruction. For example, during a discussion of the mysterious murders in *Young Sherlock*, one of the students questioned why the assassin always aimed the poison darts at the victim's neck. This conversation was captured on tape:

> *Lindsey:* "All the darts hit in the neck. Why?"
> *Andy:* "It's closer to the brain."
> *Donna:* "Why wouldn't they hit them in the head? That's closer to the brain!"
> *Mrs. Goodman:* "Why *wouldn't* they have hit him in the head?"
> *Unidentified Student:* "It could have killed him."
> *Louis:* "Because it might be like, because you might not feel it as much in the neck."
> *David:* "It may be a blood vein, and you hit 'em and that would send it into the circulation. Another thing . . . if it hits him in the head, and it hit the skull, and hit the bone, so nothing would happen."
> *Paula:* "If it had hit him in the head, it would probably bounce off."
> *Mrs. Goodman:* "Why would it bounce off, Paula?"
> *Paula:* "All the hair."
> (David is mumbling in the background that it wouldn't bounce off. He doesn't buy Paula's idea.)
> *Gwen:* "I have this body chart, and it has a vein right here [points to neck] and it is the main blood vein that travels up your neck."
> *Mrs. Goodman:* "What is the name of that vein?"
> *Gwen:* "It's the main vein that comes up from your arm."
> *David:* [on your head] "you've got hair, then the skin, then the skull. You've got to go through just to get to the brain. On the neck there's no hair, and the skin won't stop it."
> *Louis:* "You've got clothes."
> *Mrs. Goodman:* "Do you have bones in your neck?"
> *Andy:* "In health we are studying the skeleton."
> (Lindsey gets up and goes over the chalkboard to look at a chart titled "All Kinds of Skeletons." Mrs. Goodman suggests that they could ask their health teacher to answer their question. Dean says his Mom works at the Health Department. Mrs. Goodman suggests they ask her also).

This is just one example of many discussions that were initiated by students who noticed some particularly interesting event. Other students spontaneously entered into the discussion to discuss what were inherently more interesting issues to them. These discussions are different from ones that often occur in classrooms; namely, discussions (recitations may be a more appropriate word) in which the teacher asks a question, students give answers, and teachers respond by stating the answer which they feel is correct.

Understanding Story Structures

One of the major dimensions of information we have tried to help students notice is information about characteristics of good stories. We have traced the complexity of story elements by focusing students' attention on characteristics of good detectives like Sherlock and Watson (e.g., perceptive, imaginative). We also help students trace motives for actions and notice how conflicts between the protagonist and antagonist lead to atttempts to resolve goals and solve problems. *Young Sherlock* and corresponding Sherlock mysteries have provided us with rich contexts for our students to learn about multiple dimensions of stories—to analyze the story for both major and minor subplots and to determine how story elements, such as conflict and motives, influence other elements, such as plot development and goal resolution.

All our instruction about different aspects of well-formed stories (initiating events, character development, etc.) focuses on the primary video anchor *Young Sherlock Holmes* and on books (stories involving Sherlock) that are related to that anchor. In contrast, in many basal reading programs students are introduced to these concepts in the context of stories that vary from lesson to lesson. For example, students may read a folk tale and focus on examples of characteristics differentiating the personality traits of the protagonist and antagonist. In another lesson, students may read a mystery and discuss the concept of setting. After reading an adventure story, students may be asked to sequence the plot events. We are concerned that this type of instruction often fails to develop integrated knowledge structures that help students transfer to more complex tasks (e.g., writing a story of one's own).

Developing Mental Models of Important Times in History

An additional goal of our instruction is to help students develop rich mental models of what it was like to live at certain important times in history. By acquiring these models of landmarks in history, we hope to build a basis for lifelong learning. As new historical facts are encountered throughout the students' lifetime, these can easily be related to the key landmarks and hence are much easier to understand and retain.

Our approach to helping students develop a mental model relevant to our Sherlock curriculum is to help them notice details of the movie's setting, which is London, England during the Victorian Era. What types of things should one expect to find at that location during that period in time? For example, early in *Young Sherlock*, a young Watson notes that he is in London in December at the height of the Victorian Era. This 10-second scene contains a number of clues students can explore in more detail: Where is London? Does it really snow in London, and if so, does it snow in December? (Students can read their geography texts to find out about climate.) What was the Victorian Era and when was its height? Assuming that the date is the 1880s to 1890s, is it accurate for Watson to be riding in a horse-drawn carriage rather than using other transportation, such as a car?

Other scenes invite inquiry into the nature of dress in England in the 1880s, the type of lighting (when was electric lighting invented?), the types of schools (Watson attends a boarding school). Still other scenes show a pedal-powered airplane (clearly a fantasy, but a nice prompt for reading about the history of aviation and about modern "ultralight" pedal-powered planes), a chemistry lesson (which according to our expert in science is factually and historically accurate), a gym class that involves fencing, scenes of mountains just outside of London, and so forth. The movie provides a wealth of issues that can be explored.

A framework for multiple perspectives. To help students acquire a structure for a well-rounded mental model, we introduced them to a framework for guiding their noticing and for organizing their thoughts. The frame was our "Steps Toward Greater Comprehension" Framework, consisting of information categorized within a STEPS + G acronym. The framework specifies categories of information that are relevant to any point in history. It is designed to help students learn what to look for to increase the richness of their comprehension of texts and movies.

For it to become useful, we assume that our STEPS + G framework must be used, rather than merely memorized. Students were asked to revisit scenes from *Young Sherlock* to look for and categorize clues according to *S*ocial information (e.g., clothes, customers), *T*echnological information (e.g., transportation, electric lights), *E*conomic information (e.g, natural resources, products manufactured), *P*olitical information (e.g., system of government, voting rights), *S*cientific information (e.g., advances in medicine), and *G*eographic information (e.g, weather, climate). The students and teachers met in small, cooperative learning groups to share their clues and to discuss how they assigned information to the content categories. Students found this task to be highly motivating, in part because it is impossible for anyone to notice every detail in a video. Students were therefore able to see how ideas from their peers changed their perceptions of a situation.

As we worked with STEPS + G with respect to Victorian England, it became clear that *Young Sherlock* showed only part of the story of life at that time. Thus, during the second year of the project we showed students the movie, *Oliver Twist,* in addition to *The Young Sherlock Holmes.* Students were interested in the contrasting social conditions depicted in the two movies (*Young Sherlock* depicts the lifestyle of the upper classes; Oliver depicts the lifestyles of the lower classes). Students were especially empathetic with Oliver's plight.

The following are field notes taken from a tape recording of student conversations, plus notes that Debbie Rowe took while in the classroom. The class is watching a scene where Oliver is called a foundling.

> *Mrs. Goodman:* "Hear what they called Oliver?"
> She reviews the video segment.
> *Paula:* "What does that mean? Cause they found him?"
> (Mrs. Goodman asks them what kind of people were at the work house and eventually tells them that *foundling* is another name for *orphan.*)
> (They watch the next segment and Mrs. Goodman stops the tape to show the children scrubbing the floors. The students focus on Oliver.)
> *Paula:* "He's barefoot."
> *Cindy:* "He's skinny."
> (Mrs. Goodman asks why the beadle wants to see Oliver and how old Oliver is. They discuss whether the boys really have an easy life as someone on the orphanage board says. Andy says the older people are washing and ironing in the scene on the way to the board room.)
> *Paula:* "If he's an orphan kid, why do they treat him so bad?"
> *Cindy:* "Because his Mom and Dad weren't there to protect him."
> (Other children also get in on this discussion of why Oliver is treated bad. Mrs. Goodman introduces the idea that there weren't any laws to protect children from having to work long hours.)
> They watch the scene where Oliver is presented to the orphanage's governing board.
> *Cindy:* "The *board*?" [She doesn't understand what this means]

Mrs.Goodman: "Does anybody know what board is?"
David: "Owner of the workhouse?"
Lisa: "Like a committee?"
Cindy: "People who make what they do?"
(Mrs. Goodman explains that the board makes decisions. She compares it to the local board of education which decides what the students will learn, etc. They watch the "board" scene again. The beadle tells Oliver that he will learn a trade, and that he's going to learn to pick "okum."
Paula: "What's that?"
(They don't pursue this at this time, but later they do.)
Mrs. Goodman: "What did the board tell him?"
David: "That they would teach him a trade."
Lisa: "That he would go to school."
Mrs. Goodman: "A school like this?"
(They discuss what a trade is.)

Through the combination of the Sherlock and Oliver films, as well as structured activities based within these anchors, students develop a rather clear understanding of what it was like to live in England at the turn of the century. This understanding provides a basis for elaborating on readings we assign that provide further information about life at this time. Intuitively, background information from the study of videos such as *Young Sherlock Holmes* and *Oliver Twist* helps make reading passages much more vivid and realistic. By being able to imagine what it was like to live in harsh times, students find much more to discuss.

The Sherlock Newsletter

A regular part of the Sherlock curriculum is publication of a classroom newsletter every month or so under the direction of an editorial team comprised of 3 to 5 students. The team is appointed by the teacher and changes with each new publication. Editors are responsible for reading submissions and giving feedback to authors concerning typographical errors and parts of manuscripts that are in need of clarification. Each week, a one-hour block of time is devoted to research and writing for the newsletter.

The newsletter was designed to be a forum for students' creative writing and research and to promote the literacy-related activities that form an important part of the curriculum related to the macrocontext. For example, when questions arise in discussions related to the historical setting of the movies, students are encouraged to research the answers and report their findings in the newsletters. Students have published articles on such diverse topics as English Currency, Sir Arthur Conan Doyle, Earning a Living in Victorian England, The History of Fencing, to name a few. They also have published many of their own mystery stories, as well as articles comparing and critiquing characters in the movies. Newsletters are distributed to class members, teachers, and parents. Although students' participation is voluntary, we found once the first newsletter was published, students began to contribute regularly thereafter. There is great anticipation surrounding its distribution; students appear eager to see their work in a public forum.

Some Initial Findings

We are using several different research approaches in our attempt to study how to use macrocontexts such as the *Young Sherlock Holmes* anchor to invite thinking, learning, and inquiry. The first involves qualitative analyses of events that take place in the classroom. The second involves pretests and posttests of specific measures of achievement comparing the learning found in the experimental versus control groups. Below is an overview of findings from each of these approaches.

Qualitative analysis of events in the classroom. During the past academic year, participant observers in the experimental classes that use the *Young Sherlock Holmes* anchor (limitations of time and resources preclude the same in-depth analysis of the control groups) have visited classrooms twice a week for the entire academic year and have videotaped group discussions and have taken extensive field notes. Though most data are, as yet, unanalyzed, there are a few general observations that seem consistent enough to discuss here.

One of the most important set of events that has been observed involves the nature of the discussions in the classroom. Consistently, they are high level with many students participating. It is not the case that teachers engage in question asking followed by response solicitation and response giving. Often as not, students generate the questions and comment spontaneously on one another's comments. The discussions about the arrow in the neck and about Oliver's plight provide some indications of the involvement that students show. Similar types of involvement accompany discussions of the texts students are asked to read in groups. If one thinks about the degree to which experiences with the *Young Sherlock* and *Oliver* videos provide students with rich information for "breathing life" into the stories, their involvement in discussions makes a great deal of sense.

A second observation is that students are motivated to read further about specific topics. This often means trips to the library and decisions on where to look to achieve specific informational goals. Students use knowledge from the readings to enter into group discussions, which further enrich these. Overall, the video provides motivation and well-defined goals for reading to learn.

A third observation from the classroom is the degree to which students spontaneously refer back to the video to make certain points during their discussions. They are very much at home with the videodisc technology and, using a hand-held controller, can easily scan to find numbers on the disc. They also begin to take notes on the minutes and seconds on the discs that contain particular scenes. Teachers often rely on this type of information from the students to access specific scenes.

A fourth observation is that students spontaneously use new vocabulary a great deal. One of of the motivations for doing so is the desire to describe what is going on in the movie (e.g., "he is being imaginative here"). They also spontaneously use a number of our targeted vocabulary words when referring to themselves (e.g., "we need to be perceptive").

A final observation involves comments made by the teachers. They note that the students have begun to watch films quite differently. They seem to spontaneously ask themselves about setting, historical accuracy, and so on. And they like to quiz each other about what was noticed and what passed them by.

Experimental group comparisions. Much of our data comparing the experimental and control groups are still being collected and analyzed. We will summarize our initial results. (See also Risko et al., 1989; Sherwood, Williams, & Fuller, 1989).

Consider first the issue of understanding and writing stories. There were some interesting differences between experimental and control groups in performance as a function of our attempts to anchor instruction. Experimental students participated in discussions analyzing *characters' internal reactions* or feelings about events *and their motives* or reasons for their feelings and actions. They also acted out film characters, paying special attention to detail such as feelings and ways to show these through gesture, tone of voice, and such. Students thereby received extensive practice detecting character clues. At posttest we asked students to read a story and interpret character traits and feelings, and provide information from the story to explain these feelings. Experimental students were much better than control students at this task, even though the latter students had received a comparable number of basal reader lessons on character analysis.

For the lessons on *character development*, there were extremely large differences in *recall* between the experimental and control group after approximately a 6-month delay. Ideally, if asked, students would be able to provide examples of characters they had studied whose roles and personalities were developed extensively. Students in the control group had a difficult time doing this. After 6 months, they could remember a character they had read about, but only 13% could remember even one or two descriptive details about the character's personality or motives. In contrast, 90% of the students in the experimental group were able to remember details about at least one character. These findings make intuitive sense. For the students in the experimental group, lessons on character development occurring 6 months earlier had dealt with characters they continued to think about for the next several months following instruction. Since these characters continued to be involved in the students' thinking (note, however, that actual lessons on character developoment were never repeated), they were much less likely to forget about the characters. This meant they had a prototype of at least one instance of what effective character development entails.

Students in both experimental and control groups received explicit instruction on the *elements of well-formed stories*. Experimental students were introduced to these elements in the context of the main plot and subplots of the movies. Students were then transferred to written stories, and finally, they wrote their own stories using the elements as a frame. Control students were introduced to plot elements in a story and completed a basal activity for plot in the context of a second story. They also wrote stories of their own, although without explicit instruction to use plot elements as a framework for their writing. To assess students comprehension of these elements, and more generally, of the underlying *causal structure of stories*, students read a story and identified plot elements, then read a second story and answered questions about causes for story events. Some of these causes were stated explicitly in the story; others were implicit and had to be inferred. The results indicate that all groups showed some gain from pretest to postttest on their abilities to identify plot elements, although the experimental groups, especially the one comprised of at-risk students, showed greater improvements. This latter group also showed significant improvement in its abilities to draw the most difficult kind of causal inferences, (Shannon, Kameenui, & Baumann, 1988), those that are stated implicitly.

We have also assessed the degree to which the anchored instruction facilitates students' abilities to *write stories* of their own. Students in the experimental and control groups received instruction about important elements to create effective stories (e.g., setting initiating events, attempts, outcomes, etc.). However, the control group received instruction about elements in the context of different stories, whereas those in the anchored group saw how each element related to an overall whole. Data on writing samples have revealed noticeable differences between the two groups. Stories written by students in the video group were causally-cohesive stories bound by goal identification and goal resolution. Stories written by students in the nonvideo group were collections of action statements, usually presented in linear or sequential form, not integrated or tied to a plot structure. In addition, we have observed students in the video group rely spontaneously on story grammar information to edit and produce more complete and well-formed stories for the newsletter.

We have also compared the experimental and control groups with respect to comprehension and use of target *vocabulary* introduced to both classes. Both groups made progress from pretest to posttest; however, the experimental group made much greater gains. Particularly salient are measures in which we ask students to describe new video scenes they have not seen before (the scenes are picked to be appropriate contexts for use of targeted vocabulary). Across several different assessments throughout the school year, students in the experimental group were consistently more likely to spontaneously use appropriate vocabulary to describe important aspects of the scenes. These data coincide with our observations of a great deal of spontaneous use of targeted vocabulary in the daily classroom activities of the experimental group.

There are many indications that students in our experimental groups are *developing rich mental models of what it was like to live in turn-of-the-century England.* They can recall many facts about the Victorian Era. The stories they write for the Sherlock Newsletter contain information relevant to this time. Not surprisingly, the experimental group is much more likely to do this, mainly because they have had the opportunity for extended immersion in this information. Our assessments of knowledge about Victorian England represent one case in which the information available to the experimental and control groups is not equivalent, so the findings are not surprising from a theoretical perspective. Nevertheless, one of the points of anchored instruction is to help students develop rich, well-learned mental models of historical landmarks they can use for the rest of their lives. Moreover, students have acquired these mental models while learning other content (i.e., story concepts) as well as or better than the control groups and without having to invest additional time.

One of our goals in the Young Sherlock project is to do more than simply develop a mental model of Victorian England. We also want to help students acquire *a general framework for thinking about any story they read or movie they watch.* Our STEPS + G framework is designed for this. At the end of our first year, we gathered data that indicated the experimental group seemed to have learned STEPS + G in a way that made it useful to them. They were much more likely than the control group to mention a variety of relevant features when asked what they would think about when reading a new story or seeing a video segment. In addition, when shown a video segment of turn-of-the-century New York, students in the experimental group were better able to identify relevant features for that time in history. This year, we are extending our analysis of the benefits of STEPS + G by looking at its effect on student's abilities to make inferences that depend on close attention to the historical setting of new stories.

This will provide strong evidence for the efficacy of an approach to history that helps students acquire rich mental models of particular points that are especially important.

SUMMARY AND CONCLUSIONS

In summary, it appears that one way to look at video is as "the competition" since it competes with books for our students' time and attention. However, video can enhance learning. It can be used to facilitate knowledge acquisition and vocabulary acquisition and can be used to help students imagine the kinds of situations they are reading about.

Much of our project revolves around the idea of anchored instruction. A major goal is to encourage sustained thinking about a semantically rich domain and to help students experience the changes in their own noticing and understanding of what to do as new concepts and ideas are introduced. Our "Young Sherlock" project is an illustration of anchored instruction. Most of our goals in this project are literacy-related, so it was useful to ask why one would choose a video anchor rather than a verbal one. We argue that the video anchor can be extremely useful because it encourages the *generation* of text (e.g., descriptions, including new vocabulary) rather than merely the comprehension of already-written text. Based on our initial findings from the project, there seem to be some very clear advantages for anchoring instruction in a semantically rich context such as *Young Sherlock*. We are continuing to analyze existing data and to design additional studies to look more analytically at specific effects.

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AWARENESS OF TEXT STRUCTURE: THE QUESTION OF TRANSFER FROM L1 TO L2

Sally A. Hague
Duval County Schools

Recently, much attention has been focused on the necessity of reading to learn. Content area textbooks contain information that students are expected to learn through reading. In the flurry of activity surrounding the importance of learning from text, one content area has gone virtually unnoticed—foreign languages. Though students of foreign languages are regularly required to read informational text in the target language, little is actually known about the processes involved in such reading.

Interest in the reading-to-learn process has resulted in the creation of numerous reading-to-learn strategies (Tierney & Cunningham, 1984). The use of text structure is one of the most researched learning-from-text strategies (Alvermann & Swafford, 1989), one of the most frequently taught (Swafford & Hague, 1987) and one that is grounded in theory (Meyer, Brandt, & Bluth, 1980). Readers who are aware of a text's structure use this knowledge as a guide to encode and retrieve information (Meyer, Brandt, & Bluth, 1980), remember main ideas better than details (Meyer, 1977; McGee, 1981), and remember more information than readers who are not aware of text structure (McGee, 1982a; McGee, 1982b; Taylor, 1980). Readers seem to be more aware of certain text structures than others (Englert & Hiebert, 1984; Hiebert, Englert, & Brennan, 1983; Meyer & Freedle, 1984; Richgels, McGee, Lomax, & Sheard, 1987); and, some research has suggested that certain structures facilitate recall more so than others (Meyer & Freedle, 1984).

Knowledge is scant concerning the extent to which reading skills, once acquired in a reader's native language, are useful to a reader when reading text written in a foreign language. Some theorists propose that reading skills automatically transfer from one language to another (Coady, 1979; Cummins, 1979; Goodman, 1971), whereas others caution that successful transfer is contingent on the degree of proficiency in the foreign language (Clarke, 1979; Cziko, 1978). On the other hand, others have suggested that reading skills are language specific, and therefore, are not interchangeable among languages (Bernhardt, 1986; Cowan, 1976). Because foreign language readers are expected to learn from text, there is a need to learn more about the transfer of reading skills from the first language (L1) to the second language (L2).

This study used awareness of text structure as the basis to investigate several questions related to reading in a foreign language. First, to address the theoretical issue of transfer of reading skills from L1 to L2, the study was designed to determine if awareness of text structure is a skill that transfers from L1 to L2. The second purpose of the study was to examine the effects of awareness of text structure in L2 on reading comprehension. Specifically, the study sought to determine if structure-aware L2 readers derive the same benefits from their awareness as those purportedly afforded structure-aware L1 readers. Finally, the study investigated the relative merits of the different types of text structure both in conjunction with the readers' awareness and independently of the readers' awareness. The purpose of this portion of the study was to learn if one type of text structure is better for presenting information to foreign language readers.

METHOD

Subjects

The subjects in this study were students enrolled in their fourth year of Spanish as a foreign language in a large urban school district. The subjects were 10th, 11th, and 12th graders scattered among seven senior high schools. From an original pool of 92 subjects, 62 met the criteria for inclusion in the study: (a) a demonstrated awareness of text structure in English, and (b) being a native speaker of English.

Pretests

Three pretests were used to gather information about each subject prior to the actual study. The first was the Stanford Achievement Test (SAT). The reading comprehension percentile score for each subject was obtained through the central computer of the school system. The second pretest was the Modern Language Cooperative Foreign Language Test (MLA), Level L. The reading portion, consisting of 50 multiple-choice questions, was administered to each subject to obtain a measure of the student's reading achievement in Spanish. The third pretest was a prior knowledge test. The prior knowledge test was developed to obtain a measure of each subject's existing awareness of four text structures in English—comparison, problem/solution, causation, and collection of descriptions. The instrument consisted of four sets of five passages: a target passage followed by four distractor passages. For each set, the reader had to select from among the four distractor passages the passage that exhibited the same structure as the target passage and to write a reason for the choice. Only those subjects scoring 75% or better remained in the study.

Materials

Four passages on dehydration (Meyer & Freedle, 1984) were translated into Spanish. The four passages contained essentially the same information, differing only in text structure (comparison, problem/solution, causation, and collection of descriptions). The Spanish passages were checked for grammatical and content accuracy by two native speakers of Spanish. In addition, the passages were submitted to a readability analysis to determine if they were within a difficulty range considered acceptable for readers of Spanish as a foreign language (Vari-Cartier, 1981).

Data Collection

The subjects who scored a 75% or better on the prior knowledge pretest were randomly assigned to one of four treatment conditions: the comparison passage, the problem/solution passage, the causation passage, or the collection of descriptions passage. Data were collected twice.

During the first data collection, each subject was given a manila envelope with his or her name on it. Each envelope contained a prompt to set the purpose for reading, the reading passage, and a free recall test. The subjects were directed to work through the packet of materials one page at a time, being sure to replace each completed task before going on to the next one. The second data collection was one week later. At that time, subjects wrote a delayed recall response without rereading the passage.

Scoring of Free Recalls

The free recalls were scored by the researcher and two colleagues trained in the scoring procedure. Each immediate and delayed recall was given two scores. The first score was a text structure score, a score reflecting the degree to which the subject used the same text structure in writing the free recall as the author used in writing the passage. Four text structure scoring guides were developed by the researcher and were based on previously developed scoring guides (Meyer, Brandt, & Bluth, 1980; Richgels, McGee, Lomax, & Sheard, 1987). Each guide consisted of an 8-point scale, with a score of 8 reflecting total use of the appropriate text structure and a score of 1 reflecting no use of the text structure in question.

The second score was the total number of idea units contained in the free recall. The four templates used to determine the number of idea units were developed from the original content structures devised by Meyer (personal communication, October 31, 1987). Each template listed 38 idea units, with 34 idea units common to each of the four passages and four idea units different for each passage.

DataAnalysis

The data were analyzed using Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA). The measures of English reading ability (SAT) and Spanish reading ability (MLA) were used as dependent variables in the ANOVA tests and as covariates in the ANCOVA tests. The text structure score was treated as both a continuous and categorical independent variable; time and the text structure of the passage were treated as categorical independent variables. Dependent variables were the total number of idea units and the change in total idea units between testing times.

RESULTS AND DISCUSSION

Does Awareness of Text Structure Transfer from L1 to L2?

The free recall protocols were used as a measure of each reader's awareness of text structure in Spanish. Based on the 8-point scale, each immediate and delayed recall was placed in one of two categories: (a) a score on the lower end of the scale (i.e., 1–3) reflected little to no awareness of text structure in Spanish; and, (b) a score on the upper end of the scale reflected partial to full awareness of text structure in Spanish (i.e., 4–8). Using this classification system, four levels of text structure awareness in Spanish emerged from the data.

Level 1 subjects were those subjects who were consistent in their awareness of text structure. There were 27 subjects who demonstrated awareness of text structure on both the immediate and delayed free recalls. Level 2 subjects were those who were inconsistent in their awareness of text structure. There were 14 subjects who demonstrated awareness on the immediate recall, but not on the delayed. Level 3 subjects were those subjects who were not aware of text structure on either the immediate or the delayed free recalls. There were 18 subjects in this group. Finally, there were 3 subjects in Level 4. Level 4 subjects demonstrated awareness of text structure on the delayed recall, but not on the immediate. Because their behavior was considered to be anomalous, they were dropped from subsequent analyses.

To determine if the levels were different in either English or Spanish reading ability, separate One-Way ANOVAS were conducted using the SAT and MLA scores as the outcomes of interest. Table 1 presents summary statistics for the SAT and MLA scores. The ANOVA, using the SAT reading comprehension score as the dependent variable, revealed that there were no significant differences in English reading ability among the three levels of text structure awareness in Spanish, $F(2, 56) = 2.74$, $p = > .073$. The ANOVA, using the MLA reading score as the dependent variable indicated, however, that there were significant differences in Spanish reading ability among the three levels, $F(2, 56) = 10.74$, $p = < .0001$. Fisher's LSD procedure indicated a significant difference in Spanish reading ability between Level 1 ($\bar{X} = 35.4$) and Level 3 ($\bar{X} = 25.1$), $p = < .0001$, and between Level 2 ($\bar{X} = 36.3$) and Level 3 ($\bar{X} = 25.1$), $p = < .0003$.

In this study, the consistent users of text structure, the inconsistent users of text structure, and the nonusers were alike in their reading ability in English. Therefore, the transfer of text structure awareness from L1 to L2 cannot be attributed to reading ability in English. On the other hand, both the consistent users of text structure in Spanish and the inconsistent users scored significantly higher on the Spanish reading test than the nonusers of text structure. These results suggest that the transfer of awareness of text structure can be linked to reading ability in the second language. The nonusers, though very good readers in English, were not proficient readers in Spanish.

Table 1

Means and Standard Deviations for English and Spanish Reading for Three Levels of Text Structure Awareness in Spanish

Test	Level 1	Level 2	Level 3
SAT $\bar{X}$	90.4	80.2	87.0
SAT *SD*	10.5	16.1	13.9
MLA $\bar{X}$	35.4	36.3	25.1
MLA *SD*	9.1	6.8	7.2

The results of this study support Goodman's (1971) theory that reading skills transfer from one language to another. Goodman contended that the transfer was related to the reader's control of the structure of the second language, and the results of this study support this hypothesis. Furthermore, the results of this study lend support to Clarke's (1979) notion that limited control over the second language 'short-circuits' the good reader's ability to transfer already acquired L1 reading strategies to the new language. Here, the good L2 readers were able to transfer already acquired L1 reading strategies to L2, whereas the less able L2 readers were not able to make this leap.

Previous research in second language reading has led some investigators (Hudson, 1982; Johnson, 1982; Levine & Haus, 1985) to suggest that certain types of background knowledge can apparently compensate for limited second language proficiency. Specifically, they have found that second language readers, when reading texts on highly familiar topics, are able to overcome the effects of less than adequate second language skills by activating the appropriate content schemata. The results of the present study provide an interesting contrast to the results of studies investigating content schemata in that textual schemata may not have the same power to override the effects of limited language proficiency. Though all subjects in this study were able to demonstrate a prior awareness of text structure in English, only the better L2 readers were able to use this strategy effectively when reading in Spanish. Limited language ability placed an apparent ceiling on the L2 readers' ability to use the appropriate textual schema.

What Benefits Result from Text Structure Awareness in L2?

The free recall protocols were used to determine the total number of idea units that each subject remembered at the time of immediate recall and at the time of delayed recall. Table 2 presents the adjusted mean total number of idea units for each level of text structure awareness in Spanish for each passage at both the immediate and delayed times of testing.

A 3 × 4 × 2 (level of text structure awareness × type of passage × time of testing) analysis of covariance (ANCOVA) with English reading ability and Spanish reading ability as covariates was performed on the total number of idea units. There was a statistically significant two-way interaction between the level of text structure awareness in Spanish and the time of recall, $F(2, 45) = 9.86$, $p = < .0003$. Therefore, the differences in total number of idea units that were recalled between the immediate and

Table 2

Adjusted Means for Total Idea Units Immediate and Delayed for Each Passage by Level of Text Structure Awareness in Spanish

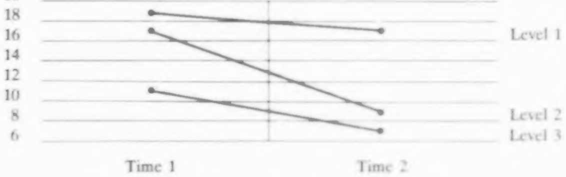
	Level 1		Level 2		Level 3	
Text	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
Comparison	19.57	17.65	17.33	8.76	11.01	5.26
Problem/Solution	14.58	16.00	16.80	8.24	12.38	7.84
Causation	19.81	17.10	18.24	15.63	9.33	8.11
Collection	19.24	17.18	16.51	4.59	14.64	7.63

delayed testing sessions depended on whether the readers were consistent users of text structure (Level 1), inconsistent users of text structure (Level 2), or nonusers of text structure (Level 3) in Spanish. In order to examine further these differences, additional analyses were conducted using the change in score as the outcome of interest.

Using the change in score between the immediate and delayed recall as the dependent variable, there was a significant main effect for level of text structure use, $F(2, 45) = 9.86$, $p = <.0003$. To determine which of the three levels of awareness resulted in significantly different change scores, Fisher's LSD procedure was used on the adjusted means. As illustrated in Figure 1, Level 1 subjects forgot on the average 1.38 idea units between the immediate and delayed testing session; Level 2 subjects forgot an average of 7.9 idea units; and Level 3 subjects forgot an average of 4.6 idea units. The Fisher procedure revealed statistically significant differences between Level 1 and Level 2 ($p = <.0001$) and between Level 1 and Level 3 ($p = <.0377$). The difference between Level 2 and Level 3 was not significant ($p = >.0825$).

The results of this analysis suggest that awareness of text structure is an important reading strategy for foreign language readers. On the immediate recall, those subjects who used the author's text structure to guide their writing remembered much more information than those who did not. Level 1 and Level 2 subjects remembered an average of 18.3 and 17.2 idea units respectively; however, Level 3 subjects recalled an average of only 11.8 idea units. On the delayed recall, the results were quite different. One week later, Level 1 subjects, the consistent users, remembered an average of 16.9 idea units—almost as many as they had remembered on the immediate recall. By contrast, Level 2 subjects remembered only 9.3 idea units, performing very similarly to the Level 3 subjects who remembered only 7.2 idea units. The erratic performance of the inconsistent users of text structure underscores the beneficial effects of text structure awareness, particularly at the time of delayed recall.

It is interesting to compare the results of this analysis with the results of an earlier study that used ninth-grade L1 readers of English. The performance of the foreign language readers in this study mirrored exactly the performance of Meyer, Brandt, and Bluth's (1980) subjects. In the latter study, subjects who were consistent users of the author's text structure forgot the least information between the immediate and delayed testing sessions. Subjects who used the text structure immediately but not a week later performed very similarly on the immediate recall to the group that consistently used the



(Level 1: 18.3-16.9; Level 2: 17.2-9.3; Level 3: 11.8-7.2)

Figure 1. Average change in adjusted total idea units from immediate to delayed testing session for each level of text structure awareness in Spanish.

author's text structure. In constrast, on the delayed test, these same subjects performed like the group that never used this strategy.

This finding is important for two reasons. First, it points to the value of using the author's text structure for both encoding and retrieving of information from text. Second, and importantly, it suggests that foreign language readers derive the same benefits from their awareness of text structure as first language readers. It seems that transfer of reading strategies not only occurs, but also that it occurs in predictable patterns based on first language research results.

Is One Text Structure More Effective Than Others?

The idea units contained in the immediate and delayed free recalls were used to examine the relative effectiveness of the various text structures for presenting information to readers of a foreign language. First, the texts were examined independently of the readers' awareness of text structure to determine if a particular type of text structure elicited greater recall than the others. Second, the relationship between the readers' awareness of the various text structures and the type of text was studied. This was done to find out if readers were more aware of certain structures than of others, and if this increased awareness was related to greater recall. Table 3 presents summary statistics for the total idea units for each passage at the immediate and delayed times of testing.

A repeated measures analysis of variance was used to determine if there were differences in the total number of idea units recalled among the four passages. The interaction between time of test and passage was not significant, $F(3, 58) = .058$, $p = >.6278$, nor was the main effect for passage significant, $F(3, 58) = 1.49$, $p = >.2269$. Based on this analysis, it was concluded that each of the four passages was equally effective for encoding and retrieving ideas contained in L2 text.

The results of this analysis do not support Meyer and Freedle's (1984) finding that the comparison passage and causation passage resulted in better recall than the collection of descriptions passage. Furthermore, the results of this analysis do not support Carrell's (1984) results with second language readers indicating that comparison, problem/solution, and causation passages each elicited greater recall than the collection of description passage. However, when the readers' awareness of the various text structures was considered, different findings emerged.

The data were reanalyzed using the straight line model to examine the relationship

Table 3

Unadjusted Means and Standard Deviations for Total Idea Units Recalled on Immediate and Delayed Protocols

	Immediate		Delayed	
Text	$\overline{X}$	*SD*	$\overline{X}$	*SD*
Comparison	15.79	8.51	12.16	6.74
Problem/Solution	13.45	6.58	9.62	4.65
Causation	17.42	7.67	14.68	6.14
Collection	18.02	7.78	12.57	8.16

between awareness of text structure and the number of idea units recalled. At the time of immediate recall, there was a significant interaction between use of text structure in the free recall and the passage that was read, $F(3, 52) = 3.59$, $p = <.0196$. After building separate regression models for each passage, it was found that there was a positive relationship between the use of text structure and the number of idea units remembered for all passages. Pairwise contrasts using Fisher's LSD procedure were done to compare the separate regression coefficients for the four passages. There were significant differences between the comparison and problem/solution passages ($p = <.0201$) and between the comparison and collection passages ($p = <.0440$) in favor of the comparison passage. Also, there were significant differences between the causation and problem/solution passages ($p = <.015$) and between the causation and collection passages ($p = <.0320$) in favor of the causation passage.

The results of these analyses suggest that the foreign language readers in this study were more aware of comparison and causation text structures than of problem/solution and collection text structures. The increased sensitivity to these two structures was paralleled by an increase in the number of ideas that the subjects were able to recall. When the data are viewed from this perspective, the results support Meyer and Freedle's (1984) finding that students were more aware of comparison and causation structures, and that they remembered more information from these two types of passages. The results partially support the findings of Richgels, McGee, Lomax, and Sheard (1987) whose sixth graders demonstrated a high degree of awareness of the comparison structure but not of the causation structure. However, the subjects in the present study as well as the Meyer and Freedle (1984) study were older, perhaps explaining the increased sensitivity to causation text structure.

Meyer (1975a; 1975b; 1977; 1985) has argued that texts can be ordered in a hierarchy ranging from very loosely organized text such as a collection of descriptions to more highly organized text such as causation. It is her contention that more organized texts provide the reader more memory cues, thus resulting in greater recall than texts that do not have these cues. The findings from the present study suggest that this may also be the case for texts written in a foreign language. However, the results of this study do not indicate that it is the texts in and of themselves that elicit greater recall, but rather the readers' relative awareness of the various types of text structure. Readers are apparently more aware of comparison and causation text structures, and are able to transfer their awareness from L1 to L2.

CONCLUSIONS

The results of this study have important implications for those who must read to learn in a foreign language. First, reading skills seem to transfer from L1 to L2, but the degree of transfer hinges on the level of proficiency in the second language. Therefore, the case for building a strong background in the structure of the foreign language and for providing the foreign language learner abundant opportunities to read in the target language is strengthened.

Second, ability to use text structure is an important reading strategy for foreign language readers. Readers who used the text structure as a guide to encode information recalled more information than those who did not. At the time of delayed recall, the effects of text structure use as a retrieval strategy were more dramatic. Like their L1 counterparts (Meyer, Brandt, & Bluth, 1980), the L2 readers in this study who used the text structure to encode information but not to retrieve it one week later forgot much more information than those readers who used text structure both to encode and to retrieve information. This finding underscores Meyer's (1977) claim that awareness of text structure is particularly crucial for retrieval of information.

Finally, the L2 readers in this study were more aware of the comparison and causation structures than the problem/solution and collection of description structures. This finding is important because foreign language students' initial exposure to informational text is often in the form of a collection of descriptions. It may be more beneficial if these students were provided early reading experiences with texts that are structured in a comparison or causation format. As such, students may have a more positive reading-to-learn experience in the foreign language.

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PRESCHOOLERS' USE OF METACOGNITIVE KNOWLEDGE AND STRATEGIES IN SELF-SELECTED LITERACY EVENTS

Deborah Wells Rowe
Peabody College, Vanderbilt University

Flavell (1976) has defined metacognition as "one's knowledge concerning one's own cognitive processes and products or anything related to them" (p. 232). He has suggested that it includes "the active monitoring and consequent regulation of these processes in relation to the cognitive objects or data on which they bear" (p. 232). Researchers have been interested in both the metacognitive knowledge students bring to learning situations and the executive or control processes they use to make efficient use of this knowledge (Garner, 1987). According to Flavell (1979), metacognitive knowledge includes awareness of person, task, and strategy variables and the way they affect the outcomes of cognitive activities. Executive processes studied under the heading of metacognition include self-regulatory mechanisms such as planning, monitoring, and evaluating problem solving attempts, as well as use of cognitive strategies aimed at solving problems.

As researchers have adopted theories of the reading process that portray readers as actively constructing meaning from text, there has been increasing interest in the role of metacognition in reading (Garner, 1987) and writing (Stein, 1986). Among the most frequently cited conclusions from this research is the generalization that young children are poor at monitoring the success of their comprehension and communication and at acting strategically to solve problems they do detect (e.g., Baker & Brown, 1984; Flavell, 1979; Garner, 1987; Markman, 1977, 1979). These findings have led Baker and Brown (1984) and others to suggest that metacognition is a relatively late-developing skill. Though some researchers (Baker & Brown, 1984; Garner, 1987; Hakes, 1980) caution that it should not be assumed that young children are completely without metacognitive abilities, the overall focus of discussion has remained on young children's metacognitive deficits rather than their competencies.

There is, however, reason to question whether young children are as deficient in metacognitive skills as the generalization cited above would suggest. Studies of children's communicative behavior in supportive settings (e.g., Chi, 1978; Clark, 1978; Revelle, Wellman, & Karabenick, 1985) have suggested that young children's metacognitive abilities have frequently been underestimated. After reviewing research in this area, Stein (1986) has suggested that "the major differences between studies that find young children capable of strategic processing and those that do not lie in the type and familiarity of materials and tasks used" (p. 235). Therefore, some studies may have found young children to be relatively poor at using metacognitive strategies in reading and writing because of the unfamiliarity of the research tasks used to tap metacognitive abilities.

An important purpose of the present study was to observe young children's use of metacognitive knowledge and strategies in familiar classroom literacy activities. In addition, this study differs from previous work in that ethnographic research techniques allowed the observation of children in hundreds of classroom situations over a period of 8 months, and the use of this background to interpret the meanings of children's behavior during writing and reading.

SETTING AND PARTICIPANTS

The setting was a daycare program where preschoolers were encouraged to author their own texts and where their writing was used for a variety of functional purposes in the classroom. Twenty-one 3- and 4-year-olds were the informants for the study. Data were collected 3 to 4 days per week over a period of 8 months as the children, the teachers, and I engaged in normal curricular activities. Though I was a participant/observer in all parts of the school day, the data discussed in this paper were collected during children's self-selected activities at the learning center designated as the writing area. Common activities for children at this center included writing or drawing texts of their own choosing, reading these texts to themselves or others, reading the texts of classmates and teachers, and watching and talking to others as they worked. Common types of texts included pictures, books, stories, and messages for peers, teachers, or parents. The conventionality of the texts varied widely, as did the way children combined print and pictures to convey meaning.

DATA COLLECTION

Data collection involved a series of four related phases (Corsaro, 1985; Lincoln & Guba, 1985). In an initial field entry phase lasting one month, I familiarized myself with the children and teachers and negotiated my role as a participant/observer. During this period I recorded observations with field notes and collected samples from the literacy events I observed. In the second phase of the study, observations were focused to collect evidence of children's metacognitive abilities, and other aspects of their writing and reading processes. Audiotape was used to increase the richness of the data. After a review of the data, a third phase of data collection lasting 2 months was begun. It involved videotape recording of literacy events selected on the basis of the emerging hypotheses about children's metacognitive strategies developed during the two previous phases of participant/observation. Fifty events lasting between 5 and 60 minutes were videotaped at the writing table. A fourth phase of data collection involved 2 additional months of participation at the center on a more limited basis. This allowed me to collect data which either confirmed or challenged previously formed hypotheses.

DATA ANALYSIS

The constant comparative method (Glaser & Strauss, 1967) was used to generate theoretical propositions about the role of metacognition in young children's literacy learning. This required data analysis and data collection to occur simultaneously so that working hypotheses could be generated to guide subsequent observations.

A final phase of data analysis occurred after data collection was complete. It involved transcription and microanalysis of events videotaped at the writing table. This analysis proceeded through four steps. First, videotapes were reviewed for evidence of metacognitive activity, and a rough tally of metacognitive behaviors was made. Subsequently, the 25 events with the most metacognitive activity were selected for transcription and microanalysis. Second, the transcripts were carefully reexamined to identify all instances of metacognitive activity. Third, the identified data were categorized to determine the behavioral indicators of metacognition exhibited in this setting. Fourth, each identified behavior was coded to indicate the type of metacognitive knowledge or processing it represented.

As a means of increasing the reliability of my conclusions, indefinite triangulation sessions (Cicourel, 1974) with the children's regular classroom teachers were used to check my interpretations of specific events. In these sessions the teachers reviewed selected segments of field notes, artifacts, and videotapes, and offered their interpretations of children's activities and talk. This information was used to refine hypotheses and to increase the trustworthiness of the findings.

RESULTS

My observation of this group of 3- and 4-year-olds during self-selected writing projects challenges the notion that young children have relatively underdeveloped metacognitive abilities. In this classroom, children demonstrated metacognitive knowledge of themselves and others as readers and writers, the writing tasks they had set for themselves, and strategies for accomplishing their communicative goals. Children actively used this knowledge as they monitored the progress of their texts and as they read and responded to the texts and authoring activities of others. When problems arose, children took steps to solve them if the problem was judged important enough to warrant a shift from writing to thinking about the process of writing.

Evidence of Metacognitive Activity

As shown in Table 1, 11 types of behavioral indicators of metacognition were observed as the children worked at the writing center. The majority of these behaviors occurred during writing, since this was the children's primary activity. However, because students read their pieces to other children and teachers, and read and commented on the work of others, some instances of metacognitive activity were observed while children were reading. Each type of behavior was also documented in field notes from the first 4 months of the study, indicating that these were typical activities at the writing table.

Table 1

Frequency of Behavioral Indicators of Metacognition in 25 Videotaped Literacy Events

Behavior	Setting	
	During Writing	During Reading
Talk about self as writer/reader	16	1
Talk about tasks	1	1
Talk about cognitive strategies	14	1
Talk about others as writer/reader	2	1
Questions about others' writing/reading	0	5
Talk about discoveries	2	1
Talk about plans for writing/reading	8	0
Talk about existence of problems	7	0
Requests for help	13	1
Corrections of other writers/readers	2	2
Self-corrections of writing/reading	3	2

Metacognitive Knowledge

Since children's goals at the writing area were either to communicate through writing or to understand the messages of others through reading, their use of *person, task,* and *strategy* knowledge was related to their roles as writers and readers.

Personal knowledge. The first category of metacognitive knowledge includes knowledge of oneself as a writer or reader, as well as knowledge of others as writers or readers. Children demonstrated this type of awareness by (a) talking about their abilities as authors, (b) talking about others as writers and readers, and (c) purposefully seeking help from specific authors.

As children participated at the writing table they frequently demonstrated their knowledge of their *own limitations and strengths as authors.* This is illustrated by Sarah's comments in Example 1.

Example 1: Feb. 3 (Videotape 12)

> Kira and Sarah are working at the writing table. Kira asks, "Do you know how to make 'K'?"
>
> "Sure," Sarah replies.
>
> "Could you make a 'K' right *here*?" Kira asks, pointing to a specific spot on her paper.
>
> Sarah makes several attempts at the 'K' turning her paper in several directions before confessing, "*Now* I don't know how to make a 'K,' but I can make a 'J.' " She writes a 'J' on Kira's paper and announces "J for Jared."

Writing events provided opportunities for children to directly test and refine their self-knowledge. Sarah's realization in Example 1 that she cannot write a 'K' in this situation is a good example of how the children's self-knowledge was continually altered and refined. It also demonstrates that their actual abilities fluctuated depending on how well-learned a strategy or skill was, and on the particular situation in which they were performing the writing activity. Self-knowledge appears to be both situation-specific and in need of frequent updating.

In addition to forming knowledge of their own abilities, children also formed a great deal of *knowledge about their teachers and classmates as authors and readers.* This knowledge was built as they had many opportunities to watch their peers and teachers write, talk with them, read their texts, and listen to their peers' reactions to texts they had written. In such an authoring community, children learned to use this knowledge to predict how others would react to texts. In Example 2, Christina makes astute use of this metacognitive knowledge to plan her text.

Example 2: Jan. 29 (Videotape 9)

> Christina begins her project by selecting a piece of folded tagboard from the rack on the writing table. The tagboard has been donated as scrap paper by one of the parents, so it has words, numbers, and lines printed on it in black. She begins to talk about the project she is planning.
>
> "Gibson will like this, but it's not for him, it's for me."
>
> Christina takes a purple marker and begins coloring over the small black numbers printed on the tagboard. As she works, she talks to herself. "But this *is* for Gibson, and he'll like it. He's not gonna be able to see any black because I'm gonna cover the black over with purple. Then the black will be a little purple. That's what's gonna happen to the black." Shaking her head, she reassures herself, "He won't throw it away."

In this event, Christina's concerns about covering up the black print grew out of many shared experiences with her friend Gibson, who had often stated that he did not like the color black, and demonstrated this by rejecting texts written or drawn in black marker. Here she is consciously making use of two types of knowledge about communicating: knowledge about her audience (Gibson) and knowledge about a graphic process (coloring purple over black). Because she holds this knowledge at a conscious level she can use it strategically to think about the project from her audience's perspective and then to plan a course of action aimed at making her text acceptable to that audience.

The third way children demonstrated their awareness of the abilities and skills of other writers and readers was their *purposeful consultation of other authors* to take advantage of their areas of expertise. Gibson demonstrates this pattern in Example 3 below.

Example 3: Oct. 3 (Fieldnotes)

> Gibson is cutting hearts from folded paper. Christina and Kira come to ask him to show them how to do this.
>
> "Watch! 'Cause that's how I learned from Hana," he tells them.

In this setting where children were encouraged to share their work with one another as well as to pursue their own interests, class members soon became recognized as experts on particular topics or literacy activities. Children strategically used their knowledge of abilities of other members of the class to find help in completing texts and solving writing and reading problems.

Task knowledge. The second category of metacognitive knowledge identified by Flavell (1979) involves knowledge about specific tasks. He suggests that in addition to knowledge about themselves and others, learners form metacognitive knowledge about the kinds and amount of information available to them during a task and what this implies for how the task should be completed. It also includes knowledge about the relative difficulty of the task. The children in this study sometimes verbalized task knowledge as the following examples demonstrate.

Example 4: Feb. 24 (Videotape 26)

> Christopher gives me a book he has just written. It is highly unconventional, so I ask him to read it to me.
>
> "I can't read it," he replies, "it doesn't have words."

Example 5: Feb. 25 (Videotape 28)

> Hana has decided to copy one of her favorite books by Lois Lenski because it has to be returned to the library. Kyle is also working at the writing table.
>
> "This is gonna be real hard," she tells him. "Kyle, *do not* bother me! You know why? I'm gonna copy off the words in this book."

In Example 4, Christopher demonstrates metacognitive task knowledge when he tells me that the reading task I suggest is impossible. Though his product is unconventional by adult standards, he has firmly established the character of the text as a wordless picture book. In this situation, he demonstrates an understanding that reading can only occur when words are present. In Example 5, Hana's warnings to Kyle demonstrate understanding of the difficulty of her self-selected copying task and her need for uninterrupted work time.

Strategy knowledge. A third category of metacognitive knowledge involves understanding what types of metacognitive and cognitive strategies are likely to be effective in achieving specific goals. The distinction between the two types of strategies is that "cognitive strategies are invoked to *make* cognitive progress, and metacognitive strategies to *monitor* it" (Flavell, 1979, p. 909). Though the young children in this study did not talk about specific metacognitive strategies used to *monitor* their progress toward writing goals, they did frequently talk about both global and specific strategies used to meet their goal of communicating on paper. *Global* strategies were transsituational approaches to learning new things and solving problems. Gibson's decision to watch Hana to learn how to cut hearts (Example 3) is an example of a global strategy. He frequently used the strategy of observing other authors' demonstrations when he wanted to learn something new. *Specific* strategies allowed children to use information about a particular literacy problem to solve it, as seen in the following example.

Example 6: Feb. 24 (Videotape 26)

> Hana, Christopher, and I are working at the writing table. Christopher is writing the words to the song "John Jacob Jingleheimer Schmidt."
>
> "I need to write 'that's my name too,'" he says indicating he needs help.
>
> Hana sings, "*That's, that's* my name too."
>
> "If Christopher needs to write 'that,' what would he put?" I ask Hana.
>
> "It's like 'the.' [Write] 't,' " she answers.

In this instance Hana linked her specific knowledge of the spelling of "the" with a "spell by analogy to known words" strategy to solve the problem Christopher has posed. (See Rowe, 1986, for discussion of other cognitive strategies used by the children in this study.)

Self-regulatory Activities

As important as demonstrating that children possess metacognitive knowledge related to writing is an examination of the ways they used this knowledge to monitor their progress toward their communicative goals, and employed fix-up strategies when they encountered problems.

Self-monitoring. One of the most consistent patterns observed was the children's monitoring of the success of their attempts to use writing and drawing to communicate. Table 2 presents examples of the seven types of evidence of self-monitoring observed.

Regardless of the conventionality of their attempts at writing or reading, children were guided by an intent to communicate and an expectation that the literacy activities and products of others also carried meaning. For this reason they were constantly monitoring the success of their understandings by checking them against their existing hypotheses about content, processes, and purposes of literacy. As long as their hypotheses were confirmed they continued to use literacy to communicate or to learn. However, when the existing hypotheses were disconfirmed, they became consciously aware of their literacy processes, and began to focus on solving comprehension or production problems or on exploring unexpected discoveries.

Compensatory strategies. Children also made use of their metacognitive knowledge in another way. After they encountered a problem, they selected learning strategies to form new hypotheses which would allow them to solve their problems. Flavell (1979) has suggested that learners orchestrate metacognitive knowledge of personal characteristics and the current task to decide which cognitive strategies will be most helpful in solving their current problem.

However, as in the case of self-monitoring, Flavell (1976, 1979) has claimed that young children are poor at acting strategically in response to problems they detect in their learning. Once again, my observations indicate that children in this classroom directed their own learning in a conscious and intentional manner. When a problem was detected, children first used their knowledge of the context of situation to evaluate the importance of the problem in terms of their current goals. Children often chose to live with some contradiction and uncertainty if it did not drastically effect their overall understanding of an event. This allowed them to continue working toward their communicative goals. An example of error detection followed by a conscious decision to proceed without using fix-up strategies is presented below.

Example 7: Feb. 3 (Videotape 12)

> Ginny has been working at the writing table for some time. She is using a plastic template to trace letters on paper. In the process she also copies some of the numbers from the template. She stops to examine her text.
>
> "Oh oh," she says. "I'm not supposed to have numbers . . . um . . . um . . . never mind."
>
> Without making any changes in the text, she leaves the writing center.

Table 2

Evidence of Self-monitoring

Comments About Writing Problems

(Videotape 12) Jared has written his name DeЯAJ on some scrap paper. He tells me, "See my E and D? My E was small so my D would have some room."

Comments About Discoveries

(Videotape 4) Ginny is drawing a picture of rainbows on some scrap paper. She begins to color in the small circles printed on the paper. "Hey look! Hey Debbie," she calls. "This is a dotted orange rainbow. It's a dot rainbow."

Requests for Help

(Videotape 14) Hana is writing a book. The first page is titled "Monday." She tells Barbie, a teacher, that she found the correct spelling for this word on a message written by a teacher during group time. Later she begins a second section of the book, she asks me how to spell "Tuesday."

Comments About Their Own Abilities

(Videotape 15) Kyle tries to cut a heart but the result is an irregularly shaped piece of paper. He says to Hana, "See I can't make hearts yet."

Self-corrections

(Videotape 11) Jared tells us that he has written a story for his mother, then reads it to Kyle. After he finishes reading, he adds the word "MOM" to signify the intended recipient of the story.

(Videotape 26) Hana is reading her book to the others at the writing table. She holds the book with the word "Monday" on the cover facing her. "This says "Monday" she says. She realizes that the others are seeing a page with a person and a rainbow. She corrects herself, "I mean *this* part doesn't say "Monday" pointing to the rainbow page. "*This* part says *Mon-day*." She runs her finger under the words and draws out the syllables as she reads.

Corrections of Others

(Videotape 14) Christopher has told Hana and me that his drawing is a rocketship. Later I write him a note telling him I like his "rocket." Hana reminds me that it should say "rocketship."

Questions about Others' Work

(Videotape 4) Christina looks at the note I am writing to Victor. I have written "dear." She asks me, "Victor starts with D?"

In this case, Ginny realized that her text did not match her original intentions, but decided either that the change did not disrupt her meaning drastically or that the openness of the self-directed writing situation allowed her to change her intended goal. Observations of this type suggest that recognizing a problem is only the first step. Deciding whether activity should be interrupted to solve the problem seems to be the next step in strategic learning. When children did decide that a problem should be resolved, they used a variety of *social* and *individual* learning strategies to help them form new hypotheses. Some of these involved seeking different types of interactions with their peers and teachers, whereas others involved a kind of inner dialogue with themselves. In both cases children were using these strategies expressly for the purpose of solving their communicative problems. (See Rowe, 1986, for a description of these strategies.)

DISCUSSION

This study joins a small but growing body of research challenging the generalization that young children have very limited metacognitive abilities. In the classroom where this research was conducted, I observed that in self-selected literacy events 3- and 4-year-olds were able to consciously monitor the success of their communicative efforts, attempt to make repairs when things went wrong, plan the next steps in their work, and use a variety of strategies to solve their own writing and reading problems.

Why should my conclusions about young children's metacognitive abilities be so different from those of other researchers (Piaget, 1976; Vygotsky, 1962; Flavell, 1979; Baker & Brown, 1984; etc.)? One possibility is that metacognitive abilities first develop when children begin to learn to write as Donaldson (1978) and Vygotsky (1962) have proposed. Because children in this classroom were learning to write, this hypothesis cannot be disproved. Although I agree with Donaldson that the lasting character of print provides a good opportunity for children to consciously examine their own communicative activities, I suggest that writing is not the only activity which yields artifacts of this type. Other common childhood activities such as building with blocks, working puzzles, and so forth provide lasting physical traces which allow children to consider problems in relation to a concrete medium.

My own explanation for the differences in these conclusions involves an argument which is parallel to the one Donaldson (1978) and others have used to challenge Piaget's theoretical position on egocentrism. As Bruner has summarized this position (1986), "it is not that the child does not have the capacity to take another's perspective, but rather that he cannot do so without understanding the situation in which he is operating" (p. 68). I would make a parallel proposal in relation to metacognition: *It is not that children do not have the capacity to monitor and direct their communication and learning, it is that they cannot do so without understanding the situation in which they are operating.* Brown and DeLoache (1978) and Chi (1978) have observed that novices of all ages are poor at monitoring their comprehension and learning. Though novices use self-questioning and self-checking strategies, they often fail to focus on the most informative areas of a problem. With experience they build up knowledge and confidence that enables them to monitor their learning more effectively.

This may explain why in the familiar context of self-selected literacy activities, children understood when communication or learning failed. The self-selected writing and reading tasks observed in this study were necessarily understandable to the students, because they were directly related to their past knowledge and experiences. Unlike many researcher-selected tasks (e.g., error detection tasks, metacognitive interviews) the informants had had time to build metacognitive knowledge of the nature of their self-selected writing tasks. These projects were linked to their previous literacy experiences in multiple ways. As described elsewhere (Rowe, 1986/1987a; Rowe, 1987b), each literacy event can be mapped as the convergence of children's *existing* and *newly formed* knowledge about the content, processes, and purposes of writing and drawing. These links to background knowledge provided children with a means for judging: (a) their abilities to complete writing tasks, (b) the requirements and difficulty of a particular project, and (c) strategies that could be used to accomplish their communicative goals. Thus, in the familiar context of self-selected literacy events, children appeared to be strategic learners who effectively used metacognitive knowledge to monitor and direct their writing processes.

IMPLICATIONS

The ethnographic method used in this study provides a different view of young children as thinkers, readers, and writers. In particular, three features of this study appear to have important implications for future research on the metacognitive abilities of preschoolers. First, by observing children over a prolonged period as they engaged in their usual writing activities, some of the fundamental problems with metacognitive research identified by Garner (1987) and Paris, Wasik, and Van der Westhuizen (1988) were avoided. Specifically, the in-process nature of observations eliminated the problem of forgetting that occurs in metacognitive interviews which ask children to reflect on past events. It also avoided problems related to students' ability to make judgments about communicative situations which are hypothetical, artificially altered, or unfamiliar. Prolonged observation provided a rich background of experiences which could be used to interpret the meaning of children's actions and talk.

Second, this study's attempt to understand writing activities from the child's perspective seems particularly important. As Corsaro (1985) has pointed out, one of the most frequent reasons for a lack of understanding of the organization and meaning of young children's behaviors may be the tendency of researchers to judge them from adult perspectives rather than analyzing their function from the children's perspective. For metacognition research this means that children's unconventional products must not automatically be judged as unsuccessful or problematic. Rather than identifying what is "unclear" or "inconsistent" from an adult perspective, in this study it has been productive to observe the kinds of problems children detect from their knowledge base.

Third, this study highlights several characteristics of curricular settings that enhance the opportunity for researchers to observe behavioral indicators of metacognition. First, in the classroom where this study was conducted children were encouraged to talk to one another as they worked at the writing table. The presence of a familiar and interested audience seemed to naturally elicit children's in-process explanations about their writing. Second, children were encouraged to seek help from one another. The result was naturally occurring peer-tutoring sessions in which children had reasons to be as explicit as possible about their thinking. And third, the teachers in this classroom had created a climate where children were comfortable talking about their authoring problems and discoveries, and where they were comfortable in questioning both teachers and other students about their work. In settings where talk is discouraged and where children are penalized for errors, it may be more difficult to see evidence of metacognition using participant/observation.

Despite these strengths, the findings of this study are limited in a number of ways. First, like all ethnographic work, the results are grounded in a specific context, and additional research is needed to describe preschoolers' metacognitive behavior in other naturally occurring settings. Second, it is likely that the ethnographic research techniques tapped only a small portion of the metacognitive activity used by children during writing. Since evidence of metacognition was not experimentally elicited, only children's spontaneous comments were recorded. It is likely that children often engaged in metacognitive activity without making overt mention of it. Like other studies using verbal reports as a measure of metacognition, the difficulty of discussing mental events most likely limited the amount of metacognitive activity observed. Third, to date, data from this study have not been analyzed to determine if there are individual differences among the children. Initial inspection of the data, indicates that all children observed at the writing table engaged in some metacognitive activity. However, statements about individual differences may be difficult to generate, because the data do not allow comparison of all children in similar writing tasks.

Finally, when the results of this study are added to the growing literature about the relation of metacognition and domain-specific knowledge, a tentative implication for practice is to raise questions concerning the current trend toward metacognitive strategy training. In the classroom where this research was conducted, it appears that children naturally monitored their own learning when they were in control of the sequence and focus of their learning, and when literacy activities had functional, understandable purposes. If situational factors such as previous experience in a problem area are key factors in facilitating children's use of metacognitive knowledge and strategies, then direct instruction in metacognitive strategies may not be nearly so important as repeated experiences with a variety of meaningful reading and writing tasks. More research is needed to describe children's metacognitive abilities in a variety of situations before metacognitive training is accepted as an important part of the literacy curriculum.

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THE EFFECT OF SMALL GROUP STORY READING ON CHILDREN'S QUESTIONS AND COMMENTS

Lesley Mandel Morrow
Rutgers University

It has long been recognized that reading to children is beneficial. Clay (1979) and Smith (1978), for example, suggest that reading to children helps them learn that written language is different from oral, that printed words on a page have sounds, and that print contains meaning.

Correlational studies have found that children who learned to read before coming to school and those who are successful readers came from homes where they were read to often (Clark, 1984; Durkin, 1974–75; Holdaway, 1979). In addition, language development, which includes syntactic complexity and vocabulary, is related to early experiences of being read to (Boroughs, 1970; Chomsky, 1972; Fodor, 1966). Experimental studies found that vocabulary, comprehension, and decoding ability were significantly improved in experimental groups where regular classroom storybook reading took place (Cohen, 1968; Feitelson, Kita & Goldstein, 1986). Case studies of children who have been read to frequently found that these youngsters knew the differences between print and pictures, the front and back of a book, and that print is read from left to right (Baghban, 1984; Doakes, 1981; Hoffman, 1982).

Some researchers have concentrated on identifying specific beneficial behaviors during one-to-one story readings, documenting, for instance, how children and parents in their home environments participate and interact in storybook reading. Apparently, being read to itself does not necessarily enhance literacy, but type and amount of verbal interaction between adult and child during story reading may. Social interaction in which participants actively construct meaning based on text contributes to success of the experience (Flood, 1977; Heath, 1982; Ninio, 1980; Teale, 1986; Teale & Sulzby 1986). Reading styles of teachers have also been found to affect children's story comprehension (Mason & Blanton, 1971; Peterman, Dunning, & Mason, 1985).

Such findings about storybook readings seem compatible with Wittrock's model of generative learning: The reader or listener understands prose by actively engaging in construction of and relationships with the textual information he or she reads (Wittrock, 1981). Moreover, Vygotsky's (1978) definition of higher mental functions as internalized social relationships may also be pertinent. Applying Vygotsky's theory, one can view storybook readings as a form of literacy development in which children socially interact with others. Literacy activities and interactions mediated by adults thus determine ideas about and skills for reading the child acquires. According to

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Holdaway's (1979) model of developmental teaching, derived from observations of middle-class homes, children benefit most when their earliest experiences with storybooks are mediated by an adult who provides a problem-solving situation. The child is asked to respond, and the adult offers information when necessary. Children and adults interact to integrate, construct, and relate to printed text.

In terms of literacy, then, the primary function of the read-aloud event is construction of meaning from the interactive process between adult and child. During story reading, the adult helps the child understand and make sense of text by interpreting written language based on experiences, background, and beliefs.

Research to date has concerned itself mostly with one-to-one read-aloud activities and interactive behavior between parents and children in middle-class homes. A few studies have dealt with story reading to entire classes. One study focused on one-to-one story reading in school with lower socioeconomic children and found behaviors between teacher and child in school were similar to those between parent and child at home (Morrow, 1988). Although it was possible to adapt one-to-one story readings in school, it is not a practical procedure when there are so many children to deal with in a classroom.

Learning in Small Groups

Many benefits, then, can be associated with one-to-one story readings in school, but the technique is basically impractical given class size. It seems appropriate, therefore, to investigate the nature of storybook readings in small groups, a setting more applicable to school situations. Having established the social nature of story reading episodes, it is pertinent to consider potential benefits of small group readings in school.

Although there is research on benefits of small group learning in general, none deals with storybook reading in school per se. Work in this area has focused on small groups of students cooperating on academic tasks, effects on academic achievement, and positive school attitudes (Johnson & Johnson, 1975; Slavin, 1983). These studies conclude generally that there is strong evidence that cooperation promotes achievement and productivity. Its positive social and attitudinal effects were seen as so beneficial that cooperative techniques were highly recommended for the classroom.

Recent research found that passive learners benefit from the dialogue and interaction of small groups and that groups of two and four students accomplished learning tasks better than individuals working alone. Higher levels of learning are often achieved when children work in cooperative groups, since youngsters explain material to each other, listen to each other, and arrive at joint understandings (Baker, 1979; Klausmeier, Wiersma & Harris, 1963; Schallert & Kleinmann, 1979).

The present study investigated the effects of small group storybook readings in school, readings that encouraged interaction between teacher and children and among children themselves. A model for story reading was designed and adapted from the interactive behaviors described in studies of parents and children at home. This model had been used in another investigation with children in school on a one-to-one basis. The present study asked the following questions: (a) Do frequent small group readings at school increase the number and complexity of questions and comments children make about stories? (b) Do frequent small group story readings demonstrate similar benefits found in one-to-one storybook readings?

METHOD

Subjects

The study took place in two day care centers servicing several communities. Eligibility to attend the center is based on financial need. The children were classified as lower-middle to lower socioeconomic level. Fifty-five percent belonged to minority groups. From the total population of 106 four-year-olds, 45 were randomly selected for the experimental group and 45 for the control group. Each group was then subdivided into 15 groups of 3 children each.

Materials

Eleven picture storybooks were selected for the story readings. One book was used for the introductory, "get-acquainted" session with all children. The 2nd and 11th books were the pre- and posttest books. The eight remaining were used during treatment sessions. Literature selections were similar in length and had well-developed story structures.

Procedures

Research assistants who worked with the experimental group attended training sessions. At session one, they reviewed guidesheets describing procedures for reading to children and prompting responses to literature, then simulated the treatment with each other. The second session, which involved practicing with children, was monitored by tape and checked for correct administration of treatment. Research assistants who worked with the control group attended a separate training session that included instruction in reading readiness activities.

To prompt responses from children in experimental groups, research assistants were instructed to use three interactive behaviors during eight story readings: (a) Act as *manager* by introducing a story with its title and some background information to provide prior knowledge; (b) *prompt responses* by inviting children to comment and ask questions, and scaffolding or modeling responses for children to imitate when no responses were made; and (c) *support and inform* by explaining parts of the story when asked, reacting to comments, relating remarks to real-life experiences, and providing positive reinforcement and praise for children's responses (Applebee & Langer, 1983; Cochran-Smith, 1984; Flood, 1977; Morrow, 1988; Ninio & Bruner, 1978; Roser & Martinez, 1985). After a story was read, the research assistant went to the beginning of the book and turned each page, asking the children to share comments or questions they might still have.

This procedure had been successful in other studies with teachers reading to one child at a time. In the training sessions it worked well, but an additional category was added to the *Managing section*. With small groups of children the dialogue was lively and often strayed from the text of the story. "Redirecting irrelevant discussion back to the story" was used by the teachers when necessary.

Story reading. Children in both groups met with research assistants once a week for 11 weeks. The first meeting with each group of 3 children was used to get to know each other. Its purpose was to help the children feel comfortable with the research assistants, who talked with them and read a story without treatment procedures. This session and all that followed in the experimental and control groups were tape-recorded so children could get used to the presence of the equipment.

The children in the experimental group were read a different story at each meeting and the same research assistant read to the same 3 children each time. The story reading treatment was used during the sessions. The children in the control group met with research assistants and worked on reading readiness tasks in small groups, focusing on identification of colors, shapes and letters. These activities were selected since they were part of the readiness program carried out in the school and teachers viewed this as helpful for them. Meetings with all children lasted for about 20 minutes per session.

Measures. Research assistants conducted the 2nd and 11th story reading sessions in both groups as pre- and posttest measures. The stories were introduced, and children were encouraged to ask questions or to comment during the story. Adults' responses were limited to brief answers to questions asked by children. Children in experimental and control groups were read Book 2 and Book 11 in the 2nd and 11th sessions, respectively. The responses of children on the tapes of these sessions provided pre- and posttest data.

Scoring. The coding system for describing children's responses to interactive storybook readings was devised from other studies that categorized children's responses to storybook readings and from an analysis of tapes from the previous investigation of one-to-one story readings. Taxonomies for traditional comprehension categories and story structure elements were also reviewed. Categories, then, were based on the literature studied and my own data. An effort was made to limit categories and to provide a coding system that could be used easily for instructional, diagnostic, and research purposes. The major categories were: (a) *focus on story structure*, (b) *focus on meaning*, and (c) *focus on print and illustrations* (Cochran-Smith, 1984; Heath, 1982; Morrow, 1985; 1987; Ninio & Bruner, 1978; Roser & Martinez, 1985; Sulzby, Yaden, 1985; Yaden & McGee, 1984). Transcribed tapes of story sessions were analyzed by research assistants blind to the group assignments of children. Children's questions and comments were counted and categorized into the major categories, and then into appropriate subcategories.

Some comments and questions occasionally fit into two categories. For example, a response concerning the resolution of the story could be coded as focus on structure or could represent a detail and be coded as focus on meaning. In such instances, a response was coded in both categories. It was counted only once, however, in calculating total number of comments or questions. Coding practice sessions were held for scorers. A reliability check among eight coders for 5 subjects yielded the following percentages of agreement: focus on print, 98%; focus on meaning, 86%; focus on story structure, 87%; total questions, 89%; and total responses, 90%.

RESULTS

A one-way analysis of covariance (ANCOVA) was conducted for each of the major categories in the posttest measures: total comments and questions, focus on meaning, focus on structure, focus on print, and focus on illustrations. The corresponding pretest scores were used as the covariates. ANCOVAs were run for some of the subcategories in each area of focus, with the corresponding pretest scores as the covariate. The teacher was used as the unit of analysis, with the mean score for each as the dependent variable or covariate as appropriate. The two different groups were treated as one independent variable with two levels, experimental and control. The teacher was used as the unit of analysis in this study as opposed to the individual child because children within a group did not represent independent observations, and therefore an assumption of the model would be violated if the individual child were the unit of analysis. Tests for homogeny of within-class regressions, an assumption of the analysis of covariance (Winer, 1971, p. 758), were nonsignificant.

Total Questions and Comments

Table 1 presents mean scores for pretest measures and adjusted means for posttest measures of children's total number of comment and question responses. Since the teacher is the unit of analysis in the study, it should be noted in Table 1 (and other tables where means are presented) that the mean (or adjusted mean) represents the average for the 15 teachers in each group. Each teacher's score was calculated by averaging means of the three students in his or her group.

There were significant differences between groups on the total questions score after treatment, $F(1, 27)=7.72$, $p<.01$; total comments score, $F(1, 27)=8.17$, $p<.01$; and total questions and comments combined $F(1, 27)=10.25$, $p<.01$. In all cases, children in the experimental group asked more questions and made more comments than the control group.

Focus on Meaning

Table 2 presents mean pretest scores and adjusted means for posttest scores for the total number of responses dealing with meaning. Scores for some subcategories in the

Table 1

Means (and Standard Deviations) for Total Comment and Question Responses

	Experimental		Control	
Types of Responses	Pretest	Posttest	Pretest	Posttest
Questions	1.21 (1.1)	2.60^a (.27)	.95 (.96)	1.20^b (.38)
Comments	5.42 (3.2)	12.01^a (.51)	5.61 (.86)	7.10^b (.34)
Total	6.63 (3.1)	14.61^a (.51)	6.10 (2.0)	8.69^b (.25)

Note. Posttest means are adjusted for pretest scores. Posttest scores in any row are significantly different $p<.05$, if they do not share the same subscript.
$^a N=15$. $^b N=15$.

Table 2

Means (and Standard Deviations) for Responses Focusing on Meaning

	Experimental		Control	
Types of Responses	Pretest	Posttest	Pretest	Posttest
Total Meaning	5.68 (1.56)	10.28^a (.80)	5.07 (2.00)	6.07^b (.61)
Detail	.70 (.92)	2.84^a (.34)	.75 (.54)	1.66^b (.24)
Prediction	.48 (.63)	1.51^a (.44)	.62 (.40)	$.70^b$ (.29)
Draws from Experience	1.04 (1.0)	2.18 (.76)	1.60 (1.0)	1.80^b (.15)
Interpretation	.50 (1.0)	2.30^a (.18)	1.05 (1.4)	1.50^b (.18)
Narration	.34 (.54)	2.03 (.29)	.38 (.30)	$.28^b$ (.31)

Note. Posttest means are adjusted for pretest scores. Posttest scores in any row are significantly different $p<.05$ if they do not share the same subscript. The categories of labelling and asking for definition are not reported here since the response was so small statistical calculations were not carried out on them.

[a] $N=15$. [b] $N=15$.

area of meaning are also shown. Two categories (labelling and asking for word definitions) had very few responses and therefore statistical analyses were not calculated for them.

The experimental group was significantly different from the control in the number of responses made in the meaning category with the experimental group's scores higher than the control group's, $F(1, 27)=10.21$, $p<.01$. In the subcategories that were analyzed, the groups were significantly different from each other, with the experimental scoring higher than the control in the areas of detail, $F(1, 27)=8.20$, $p<.01$; interpretation, $F(1, 27)=7.19$, $p<.01$; drawing from one's experience, $F(1, 27)=7.15$, $p<.01$; prediction, $(F, 27)=6.98$ $p<.01$; and narration, $F(1, 27)=12.28$, $p<.01$.

Focus on Structure, Print and Illustrations

Table 3 presents means for pretest scores and adjusted means for posttest scores for the total number of responses dealing with story structure, focus on illustrations, and focus on print.

In the category of focus on story structure, there was a significant difference between groups, with the experimental scoring higher, $F(1, 27)=5.96$, $p<.01$. There were few responses in this category and most subcategories were not used at all. The area that accounted for the most responses was reference to characters. Because of the limited number of responses, only total focus on story structure was analyzed statistically.

Number of illustration-related responses differed significantly between groups, with the experimental children making more responses in this area than the control, $F(1, 27)=4.35$, $p<.01$.

On the total number of responses dealing with print, once again there was a significant difference between groups, $F(1, 27)=6.58$, $p<.01$, with the experimental

Table 3

Means (and Standard Deviations) for Responses Focusing on Structure, Print and Illustrations

	Experimental		Control	
Type of Responses	Pretest	Posttest	Pretest	Posttest
Focus on Structure	1.10 (1.0)	3.03[a] (.36)	1.81 (1.35)	2.14[b] (.33)
Focus on Print	.64 (.32)	1.18[a] (.29)	.39 (.33)	.42[b] (.10)
Illustration Related	.62 (.90)	1.01[a] (.25)	.57 (.31)	.63[b] (.25)

Note. Posttest means are adjusted for pretest scores. Posttest scores in any row are significantly different $p<.05$, if they do not share the same subscript.
[a] $N=15$. [b] $N=15$.

group demonstrating more responses than the control. There were, however, very few responses in this category. Because of this limited response, only total focus on print was analyzed statistically.

DISCUSSION

This investigation revealed that reading to children in small groups with guided adult interactive behavior increased verbal participation and complexity of that verbal interchange. Children in the experimental group asked more questions and made more comments than those in the control group. These findings are similar to those of a previous study which used the same treatment with children one-to-one (Morrow, 1988). Different from the results of that earlier study, however, is the fact that youngsters in this small group study began to respond after the first reading. In the one-to-one study, responses did not occur until about the fourth session. It should be noted that children in this study for the most part were not read to at home, according to results of a questionnaire sent to their parents. In addition, children in the day care centers had by earlier policy been instructed *not* to interrupt while stories were read to the whole class. The small group study revealed that children repeated what other children said and elaborated on each other's comments, something that could not happen in a one-to-one setting. At the same time, there was also more irrelevant discussion, making it necessary for the teacher to redirect conversation back to the story. These findings are supported by the literature on small group instruction. Earlier it was mentioned that children learn better in this setting because they use language that other children easily understand. Piaget (1959) suggests that peers serve as resources for one another in cognitive development while exchanging information in learning situations with each other.

Informal Observations

Teachers in the study were interviewed to determine their reactions to reading to children in small groups. They described the small group setting as more relaxed than when reading to a whole class. They felt that children's attention spans were better in small group than in large group story readings and that children seemed to listen to their peers, respond to them, and learn from them. Children were able to be actively involved, pointing to illustrations and commenting. Because the group was small, everyone could participate. Teachers could establish good eye contact and all children could sit close to them, thus excluding no one from the event. Teachers specifically mentioned how children seemed to inspire other children by repeating each other and elaborating on each other's comments. As individuals, children offered many interpretations of story theme, thus enhancing the complexity of discussion.

Teachers needed to redirect discussion since children did get off the story theme. But, they reported an interactive, social atmosphere and agreed that children who did not respond in whole group settings because it was overwhelming or those who were quiet in the one-to-one settings, which made them self-conscious, were often responsive in the small group.

IMPLICATIONS

Small group readings in a school setting can increase low-SES children's question and comment responses to literature in both number and complexity, providing a rich source of information for the child. The study did not determine effects of the treatment on comprehension development; another investigation should be conducted to determine whether increase in comments and questions develops a deeper understanding of a story and better meaning-making strategies that children can apply when they become readers. One can only speculate at this time that comprehension of story may be enhanced through this interactive story reading experience since children's responses did become more complex.

Storybook reading in small groups provided a cooperative, social atmosphere in which adults and children interacted with and learned from each other. There seemed to be respect for what others had to say and, because of diversity of responses, a great deal was learned. All children were able to be included, especially the passive child who gets lost in the whole class and may be too shy or self-conscious to respond with the teacher alone. From teachers' and children's comments as well as from the data, it appears that children served as resources for one another; they exchanged information which resulted in productive verbal participation.

This study has implications for instruction. It became apparent during the project that children are more interested in the meaning of stories than in issues of print. Children demonstrated the use of interpretive responses (association, prediction, and elaboration). Teachers need to accommodate this interest with discussions on an interpretive level, a departure from early reading activities which tend to stress the mechanics of reading more than meaning or of meaning only at the literal level.

Small group readings seem to be an important strategy in early literacy programs, especially if children are not being read to at home. Small group instruction is already practiced with young children in school. It should not be difficult to use the setting for reading stories.

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PRESCHOOLERS' CONCEPTIONS OF LITERACY AS REFLECTED IN THEIR SPONTANEOUS PLAY

Susan B. Neuman
University of Lowell

Kathy Roskos
John Carroll University

Much attention in the last decade has centered on the young child's developing conceptions of features and forms of written language. Ferreiro and Teberosky (1982) provided an analysis of how children come to know language through exploration of print as a cultural object. Clay (1967, 1969) and others (Y. Goodman, 1984; Y. Goodman & Altwerger, 1981; Mason, 1980) have described the young child's emerging concepts about print conventions, such as directionality and punctuation, speech-to-print match, and sense of word and letter. Attention to how children come to know the features or technicalities of written language has contributed substantially to a growing understanding of early phases of literacy development.

Less attention, however, has centered on the young child's developing conceptions of functions of written language, even though some have suggested such knowledge is "of crucial importance" in literacy learning (Downing, 1979; Wells, 1985). A number of metalinguistic researchers have focused on young children's cognitive confusion and failure to display conventional knowledge of literacy (Downing, Ollila, & Oliver, 1977; Yaden, 1984). Others, however, have argued that functional principles young children develop at any early age represent "real" uses of written language (Y. Goodman, 1984; Harste, Woodward, & Burke, 1984).

Relative lack of research and agreement about the functional dimension of written language may be attributed to two factors. One is the confusion surrounding the word "function" itself. The term has been used broadly in conjunction with "purpose" or reasons for written language, such as "for communication" (Downing, 1979; Yaden, 1986), or perceptions of written language, as in "What is reading?" (Johns, 1986). It has also been used to denote the context or situation-of-use of written language which serves to make encounters with print meaningful (Y. Goodman, 1984; Harste, Woodward, & Burke, 1984; Heath, 1982, 1983; Rowe & Harste, 1986). This variety of definitions has limited the ability to generalize across studies.

Another contributing factor is a methodological issue: investigations of the young child's understanding of uses of written language have generally been in decontextualized settings with minimal consideration of the child's point of view or reference (Hall, 1987). Deficiencies are highlighted while emerging conceptions may remain in

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the shadows. Although some recent studies have suggested more liberal scoring criteria when examining youngsters' responses to functional tasks (Lomax & McGee, 1987), these are derived from conventional test settings. In short, there is little available information describing functions of written language as perceived and used by young children on their own terms.

The possibility that children do have some working notions about functions of written language has been evidenced in a number of recent descriptive studies. Y. Goodman (1984) referring to these as "functional principles," cited ownership, labeling, and invitations as examples of "real" functions of written language for young children. Providing evidence from an ethnographic study, Jacob (1984) reported emerging conceptions of functions of written language in the play of Puerto Rican kindergartners. For example, children pretended to construct and use shopping lists, buy goods with food stamps, and get prescriptions from a doctor. Similarly, Roskos (1988), in describing the play activities of 8 preschoolers, found children used reading and writing to legitimate their pretend play, to express themselves, and to record information within play events. Examining children's developing conceptions of literacy in a child-controlled environment may provide a more conducive setting to describe their knowledge of functions and features of print in early literacy development. As children play, they may be demonstrating constructive hypotheses about written language as a "sense-making" activity.

This study examined preschoolers' emerging conceptions of literacy in the naturalistic environment of spontaneous play, defined here as voluntary, self-selected, "free play time." There were two questions: (a) What are common functions and features of literacy as evidenced in children's spontaneous play in a preschool setting, and (b) how frequently do they occur across different groups of preschoolers?

METHOD

Subjects

Fifty children (26 boys; 24 girls), ages 3.2–4.6 ($M = 4.0$), from two preschools, participated. All were native speakers of English. Twenty came from professional families and attended a preschool in their immediate neighborhood. Thirty resided in federal-assistance housing and attended a local preschool supported by the state. Although differences in quality of materials in these schools were evident, both included a house/kitchen corner, a block area, a coloring/writing table, and a book corner.

Procedures

Our observational procedures employed an approach developed by Singer and Singer (1980), in their analysis of pretend play behavior among preschoolers. Four graduate students in language arts were trained as observers to record the child's actions and language (verbatim). They were instructed not to interpret behavior, but to record what actually occurred during observational periods.

Each child was individually observed during free play for 10 minutes on four occasions by two observers over a 2-month period, yielding 200 play protocols.

Analysis

Protocols were content analyzed in three phases. First, play segments were analyzed for evidence of literacy demonstrations, defined as instances of reading or writing-like behavior, including scribbling, marking on paper, pretending to read, book-handling, or attending to print in some manner. Second, boundaries segmenting each literacy-like behavior were established to code each demonstration. Two indicators were used to establish boundaries: shifts in focus of play activity (e.g., switching from playing in the kitchen to the book corner), and shifts in interaction between players (e.g., a player initiated play/talk with someone else on a new topic). Third, each demonstration was analyzed for function, defined here as processes which indicated children's understanding of reading- and writing-like behaviors.

Each author independently read 25 randomly selected protocols and identified functional categories. Categories were compared and frequently used play behaviors extracted. Five categories of functions were identified (see Table 1).

Literacy demonstrations were also analyzed for featural knowledge of written language. Categories were established by combining several classification schemes reported in studies of emergent literacy (Clay, 1979; Reid, Hresko, & Hammill, 1981; Taylor, 1986). Three broad categories of features were analyzed (see Table 2).

Following training and practice sessions, two research assistants independently coded a sample of 20 play protocols for play boundaries, function, and feature. Intercoder reliability indicated perfect agreement in determination of boundaries, .93 for function and .95 for feature. All remaining protocols were then coded for functional and featural categories.

RESULTS AND DISCUSSION

A total of 103 literacy demonstrations were recorded in the 200 play protocols. The number of demonstrations ranged from 0–16, with a median of two events occurring during the 40 minutes of free play activity for each child.

Frequencies of functions of literacy are in Figure 1. Exploratory, interactional, and transactional functions were most commonly found in children's play activities. Children demonstrating the exploratory function used reading and writing to manipulate and investigate elements in their environment. Examples included playing with file folders, handling letters, and using a typewriter. The interactional function focused on the social and communicational nature of literacy. Here, children used reading and writing to spend time with others, to play games, and to pretend to record information. The transactional function emphasized uses of literacy as a means to negotiate meaning between print and the user. Children used reading or writing to label or name items, and to make events more meaningful in play.

Uses of literacy for personal reasons, to claim ownership, or to aid memory, and for authenticating actions were found less frequently in the play protocols. It may be that such functions are not as applicable in the public arena of play as the others.

Frequencies of demonstrations of features of literacy are in Figure 2. Children demonstrated understanding that print carries a message while engaged in activities of

Table 1

A Typology of the Functional Domains of Literacy as Evidenced in Children's Spontaneous Play

Domain	Kinds of functions	Examples
Exploratory (The "how does it work?" function)	To experiment with print	Jackie writes 'o,' 'h,' 'a.'
	To handle literacy-related materials	"We're opening all these envelopes."
	To figure out how to do	"It says open right here."
Interactional (The "between you and me" function)	To play a game	"Let's play cards."
	To communicate with others	"I'll give something to you (a note). It's about you coming over. You have to come over."
	To share information	"Would you read this to me?"
Personal (The "for me" function)	To express oneself	"I write the word 'love'. I like to write it."
	To claim ownership	"This is my picture."
	To aid memory	"I have to make a list of phone numbers."
Authenticating (The "Legitimating" function)	To verify information	"You see, Susan, it saying 'Happy Arbor Day'."
	To act grown up	"We have to have all our taxes and I'm filling the taxes this year. You did 'em wrong last year."
	To endorse	"They have to come to the doctor's by noon to make an appointment."
Transactional (The "between me and text" function)	To label	"This doesn't say 'stacho'."
	To communicate about	Pointing to book, "I'm over on this page."
	To construct meaning from text	Tells teacher that the picture book says "I love you."

their own volition. Further, they illustrated some knowledge of technical features of print, as in letter names, word knowledge, and spellings. About one third of the literacy demonstrations included this featural knowledge. These categories lend support to Y. Goodman's (1984) position that linguistic awareness develops in conjunction with its use.

Understanding of conventions of print were less evident in their play behavior. One obvious explanation is that children in the play context do not have opportunities to display such knowledge. A less obvious one, but also observed in related research,

Table 2

A Typology of the Features of Literacy as Demonstrated in Children's Spontaneous Play

Features of Literacy	Examples
Awareness of text messages	Finger pointing to print Reading pictures from print Pretending to read Pointing to printed label
Awareness of symbolic representation	Points to a letter Distinguishes letter by name Differentiates letter and number Awareness of words Recognizes specific sight words
Awareness of the conventions of print	Book handling Shows left to right orientation Shows top or bottom of printed artifact

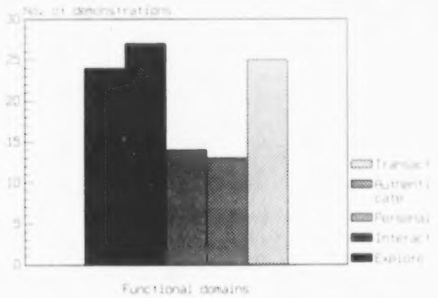

Figure 1. Demonstrations of the functions of literacy in preschoolers' spontaneous play.

may be that such knowledge has already become internalized, and is almost habitual by the preschool years. This knowledge may be overshadowed by children's increasingly more sophisticated problem-solving concerns, including attempts to read actual print or draw letters (Y. Goodman, 1984; Reid, Hresko, & Hammill, 1981).

Chi-square analyses were conducted to determine differences between gender and socioeconomic status in recorded number of literacy demonstrations across groups. No significant differences were reported for gender ($\chi^2 = 4.0$, $df = 7$, $p < .73$), or SES, ($\chi^2 = 8.13$, $df = 7$, $p < .32$), indicating that at this initial stage of emergent literacy, children's conceptions of print were not differentiable by these characteristics.

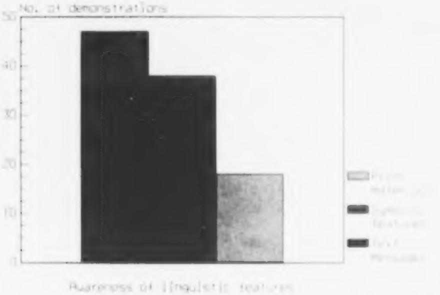

Figure 2. Demonstrations of the features of literacy in preschoolers' spontaneous play.

CONCLUSIONS

Results of this exploratory study indicated preschoolers demonstrate a broad number of uses of literacy on their own and with others, in ways meaningful to them. The findings provide further evidence that young children do indeed develop conscious knowledge about the forms and functions of written language at a very young age. In their play, preschoolers reveal early attempts to understand and gain power over rules of literacy.

There also appears to be broad categories of functions which are common across different groups of preschoolers. We hypothesize that these large domains of functions may characterize the young child's meaning networks or emerging conceptions of what written language is used for. It is within these boundaries that the novice may be genuinely exploring how written language works. Although we observed five major categories during spontaneous play, broader-based studies need to verify presence and commonality of these domains of functions and their possible influence on literacy development in general.

The results highlight the intimacy between function and feature. Like strata, features of written language seem to be layered in written language functions and to appear as the function unfolds. We experienced little difficulty in locating evidence of featural knowledge. Of special interest, however, were suggestions of possible relationships between types of domains of functions and kinds of featural knowledge displayed. More investigation is warranted since this area addresses the "form follows function" hypothesis in literacy learning, which this study and others imply (K. Goodman, 1986; Wells, 1986).

In the broadest sense, the study supports the "everything is happening at once" perspective on literacy development (Y. Goodman, 1984; Hall, 1987; Harste, Woodward, & Burke, 1984). In its narrowest, it provides direction for more finely tooled studies of young children's conceptions of functions of written language and how these influence children's awareness of features of literacy learning.

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WRITTEN LANGUAGE KNOWLEDGE HELD BY LOW-SES INNER-CITY CHILDREN ENTERING KINDERGARTEN[1]

Victoria Purcell-Gates
University of Cincinnati

Failure of low-income, inner-city children to read and write at levels comparable to their middle-class counterparts is well known. Historically, educators have focused on "causes" of this phenomenon with ambiguous results. Head Start programs have directed energies at preparing low-income preschool children for school literacy instruction. Title I programs have poured monies into support services for these children at school. Although all these programs have shown some effectiveness, none has been successful in bringing this population out of the bottom quartile of achievement in reading and writing (Berlowitz & Durand, 1980; Davis, 1982; Obgu, 1985).

Educators balk, however, at abandoning these children to low levels of literacy learning; the struggle to find a solution to the problem continues. Research has recently focused on establishing a thorough knowledge base on which to base future intervention programs, the hope being to prevent continued failure of poorly, or incompletely, conceived educational programs. This report results from one such project and focuses on the knowledges of written language held by low-income, inner-city children at the start of formal instruction in literacy in their kindergarten year.

Taking a constructive approach to literacy learning dictates the need to establish what children understand about written language prior to formal instruction. To describe the process of learning to read and write in school, one must first account for schemata for written language with which children will interpret their instruction. Research into young children's literacy development shows that children born into literate societies acquire information about literacy from birth (Dyson, 1982; Ferriero & Teberosky, 1982; Goodman, 1984; Taylor, 1983), determined by the role literacy plays in the child's sociolinguistic culture (Purcell-Gates, 1986).

Most research in emergent literacy has been conducted with middle-class children and has documented knowledges about written language acquired during preschool years. This information is generally used to call for beginning literacy instruction which respects knowledge about reading and writing brought to school by children.

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Another way to view this research is to consider knowledge acquired during early years as schemata with which children interpret instruction they receive when they begin school. Considered from this perspective, these knowledges may partially account for success generally experienced by middle-class children in learning to read and write during the primary grades.

This line of logic leads to the attempt to describe as completely as possible the knowledges of written language held by low-income, inner-city children as they begin kindergarten. It is unlikely that one will be able to understand why formal literacy instruction results in inadequate levels of achievement for these children without an accounting of the written language schemata they bring to instruction.

METHOD

Subjects

Thirty-five children were randomly selected from three kindergarten classes in three inner-city schools in a mid-sized midwestern city, balanced across schools for number and within schools by sex. Children were classified as low-income if they qualified for the federal free-lunch program. None could read or write independently with the exception of 1 boy from School B, reading at approximately 1.6 grade level (Stanford Achievement Test, 1982).

School A served a predominantly Black population residing next to a fairly exclusive, mainly White, residential enclave. Although the school attempted to draw White children, the kindergarten from which the sample was drawn was 99% Black. Families of the children were financially supported through full- or part-time jobs or through public assistance. School B served public housing projects in the inner city. Children were 99% Black. Families were for the most part on welfare and unemployed. A few parents held part-time jobs. Many children came from single-parent households with several siblings who often had different fathers. Extended family networks existed for many, either within apartments or across apartments but within the projects. School C served a predominantly White population with a history of Appalachian migration. Families were employed at low-paying jobs or were recipients of public assistance.

Materials

Assessments were chosen or developed to cover as complete an area as possible of knowledge about written language. This knowledge was viewed theoretically as a whole which could be examined as different pieces and on different levels. Six domains of written language knowledge were chosen which have been shown to be related to learning to read and write in school:

1. *Intentionality*—defined by asking, "Does the child understand that written language carries meaning, that is, is intentional?" Or as Harste, Burke, and Woodward (1984) define it: "Is there an expectation on the part of language users and learners that written marks are cultural objects or signs, which signify?"
2. *Story Structure Knowledge*—an implicit schema for macrostructure elements of fictional narrative.

3. *Written Narrative Register*—an implicit schema for sentence-level features typical of written narrative.
4. *Alphabetic Principle*—defined as understanding of ways English written language maps onto oral language or understanding of a grapheme/phoneme relationship.
5. *Concepts of Writing*—reflection of ways children conceptualize writing as a system (i.e., with the directive to write anything they can, do they draw borders on the paper, draw pictures, write letters, or write words?).
6. *Concepts About Print*—Clay's (1979) test, measuring understanding of conventions for reading and writing English was used. These knowledges include (a) front of book, (b) that print (not the picture) tells the story, (c) first letter in a word, (d) big and little letters, (e) directionality, (f) concepts of "letter" and "word," and (g) identification and functions of punctuation marks.

General Procedures

The researchers (Dahl & Purcell-Gates, 1987) collected data from Schools A and B; a research assistant collected data from school C. Collection of pretest data began after 2 weeks of daily attendance in classrooms in which we served as aides. This was undertaken to familiarize the researchers with the children and them with us. Any duties casting us in authoritarian roles were declined. There were three testing sessions per child, each lasting approximately 20 minutes. Tasks were administered individually in a quiet location in the school from which all environmental print had been removed or masked. Responses were audiotaped. Order of administration was counterbalanced across subjects and sexes. Exception to counterbalancing was the *Intentionality* task, administered first to avoid the effect of teaching children the concept through experience with other tasks.

DATA ANALYSIS AND RESULTS

Intentionality

Each child was presented with a sheet of 8 1/2 × 11 paper on which was displayed in primary type this sentence from a children's book: *A long time ago there was an old man*. We asked: (a) Is there something on this paper? (b) What do you think it is? (c) What do you think it could be for? (d) Why do you think it could be there? (e) If the child answered "writing," "words," or "letters" but did not answer other questions, the researcher probed with "Have you ever seen writing (or words, or letters) before? What do you think that it was for? Why do you think we have writing?"

Responses were categorized, and rated from 1 to 5 according to how close they were to indicating the child understood that written language carries meaning. The scale ran as follows: 1 = *No Evidence of Concept* (letter-label responses, i.e., naming letters, or saying they were letters, with unsatisfactory or no response to probes; 2 = *School-Related Objects* (indicating a limited functional view of writing as something that belongs in school, much like desks or chairs, i.e., when asked for reasons for "letters" or "words" they responded that they are for school, for teachers, to learn how to go to school, to know the alphabet, etc.); 3 = *Names as Labels* (indicating a limited but personal functional view of writing—writing is for writing names);

4 = *Marks Seen on Objects in the Environment* (indicating a broader functional view of writing but still one mainly as labels or "markers," i.e., "for toys and games" and, in one case, "at the bank"); 5 = *Print is Meaningful or Evidence of Concept of Intentionality of Written Language* (presenting examples of functions of print such as writing a letter, giving directions, reading attempts, and in the case of the one reader, actually reading the sentence).

The average score across schools was 2.91 (*SD* = 1.58), indicating a relatively restricted view of written language; indeed most of the children indicated letters (or letters and numbers as most of them called them) were things for school, were for learning their ABC's, and so forth.

Story Structure

Story structure was assessed with two tasks, the order of presentation counterbalanced across children and sessions. One was designed to elicit a story. To accomplish this, we played with small hand puppets with the children for about 3 to 5 minutes, assuming fictional roles and setting up an interaction with the child's fictional role. We then asked the child's puppet character, through our own puppet character, to "tell us a story."

For the second task, we read a simple story to the children called "Albert the Fish," taken from previous story schema research (Whaley, 1981), Prior to reading, children were told they could retell the story into the tape recorder so the rest of the class could hear it. Following reading, we shared gumdrops with them to forestall recency and rehearsal effects and then asked them to retell the story.

We analyzed story productions and retellings for story structure elements of: (a) *Setting* (2 points): character, place, time, and so forth; (b) *Beginning* (1 point): precipitating event of an episode; (c) *Reaction* (2 points): character(s) reaction to beginning and formation of a goal; (d) *Attempt* (1 point): effort to achieve the goal; (e) *Outcome* (1 point): success or failure of the attempt; and (f) *Ending* (1 point): long-range consequence(s) of the attempt and outcome.

Children's retellings were analyzed on the basis of the story actually retold and not on the fit between the retold story and the "Albert the Fish" story. Both stories were scored and the highest score of the two chosen as the one most indicative of the child's implicit schema for story structure. Average score for Story Structure was 3.37, (*SD* = 1.52). Three children refused the task, and, in general, those who participated produced fragmentary texts. An illustrative story is:

> Once upon a time, it was a old witch. She gave her so many children she ate all of 'em up. 'Cause she was puttin' them in a pan . . . and gave 'em some /patty/ . . . she put 'em in a oven . . . an' ate 'em up.

Placing words between slashes (/) indicates the transcriber is unsure of the transcription. This story received a score of 3 (1 for Setting, 1 for Beginning, and 1 for Reaction).

Written Register

To determine what children knew implicitly about lexical and syntactic features considered typical of written narrative, they were given two tasks with order of presentation counterbalanced. For one, children were asked to tell us about their latest birthday from beginning to end (whether it was a party or not), asking them to tell who was there, events, and surroundings—all elements of narrative. The other task asked children to pretend they were some person in their lives who would read to them and to pretend to read a story from a wordless picture book to a doll we provided. They were prompted several times to make the story "sound like a book story."

Resulting narratives were analyzed for an increase in frequency in written-register narratives of 14 lexical and syntactic features and a decrease in frequency in written-register narratives of exophoric/deictic references (linguistic references to items outside the text such as "*There* is the man who was following them"). This is the same task used several years ago to show existence of a written narrative register in children who have been extensively read to (Purcell-Gates, 1988).

Total score received by a child represented frequency of use of written narrative features and number of features showing the expected increase or decrease—depth and breadth so to speak. Average score was 23.64 ($SD = 17.33$). Since there is no perfect score for this task, to give it meaning, I compared it with written-register narratives of the well-read-to kindergartners, rescored for the present purpose. The well-read-to kindergartners represented a mix of lower-middle to middle-class children, and a racial mix of Oriental, Caucasian, and Black. "Well-read-to" was defined for that study as having been read to at least five times a week during the 2 years preceding the study. The highest score for the well-read-to sample was 140 with the mean score at 42.03 ($SD = 19.27$).

Results indicate that overall, children in the present study possessed a restricted knowledge of "book language," knowledge shown to influence quality of miscues and comprehension for older children (Leu, 1981). An example of a written narrative attempt representing the average score is this beginning of one of the "book stories":

> He had a stick on the door . . . then she . . . he opened the door . . . all/wide/ . . . with the stick . . . and . . . then . . . when he . . . came . . . out . . . side . . . he brung the stick . . . with him . . . then he hide . . . in the bushes . . . and then . . . he brought the stick out. . . .

Alphabetic Principle

Children's understanding of the alphabetic principle was probed through a variety of reading and writing tasks. For *reading*, a version of the environmental print reading task used by Goodman and Altwerger (1981), and Harste et al. (1984) was administered. Combing the respective neighborhoods for salient environmental print, we collected 10 words and prepared three conditions for reading. The words were (a) phone, (b) milk, (c) Tide, (d) Band-aid, (e) Coke, (f) Crest, (g) School Bus, (h) Stop, (i) Hershey's, and (j) McDonalds. The conditions in which they were presented were (a) in full context (i.e., on a real box of Tide; a phone sign from a telephone booth, etc.); (b) in two-dimensional, partial context (photo of the stylized print with immediate context of logo); and (c) print completely decontextualized, typed onto a 5 × 8 index card in primary type. Word order and condition presentation were counterbalanced across subjects.

For *writing* tasks, we asked children to engage in two activities. For one, we asked them to write their names and anything else they could, then asked them to tell us what they had written. For the other, we asked them to spell 10 words: (a) bump, (b) pink, (c) drip, (d) ask, (e) bend, (f) trap, (g) net, (h) chin, (i) flop, and (j) last. Order of presentation of the words was counterbalanced across the children.

We scored reading and writing attempts on a 3-point scale developed from categorizing the raw data. A score of 1 indicated no evidence of the alphabetic principle; 2 indicated some evidence (2–3 instances); 3 indicated a consistent pattern (4 or more instances). Scores across tasks were averaged for each child to obtain one score for this concept.

Mean score across all subjects was 1.28 (*SD* = .44). In general, children evidenced almost no knowledge of the phoneme/grapheme mapping of English. Aside from the child who was reading when he began kindergarten, only a few children understood the alphabetic principle on a holistic, prephonemic level—typical of the very beginning stages found in the research on invented spelling (Read, 1971). Two samples from a child with a total score of 1.2 are in Figure 1.

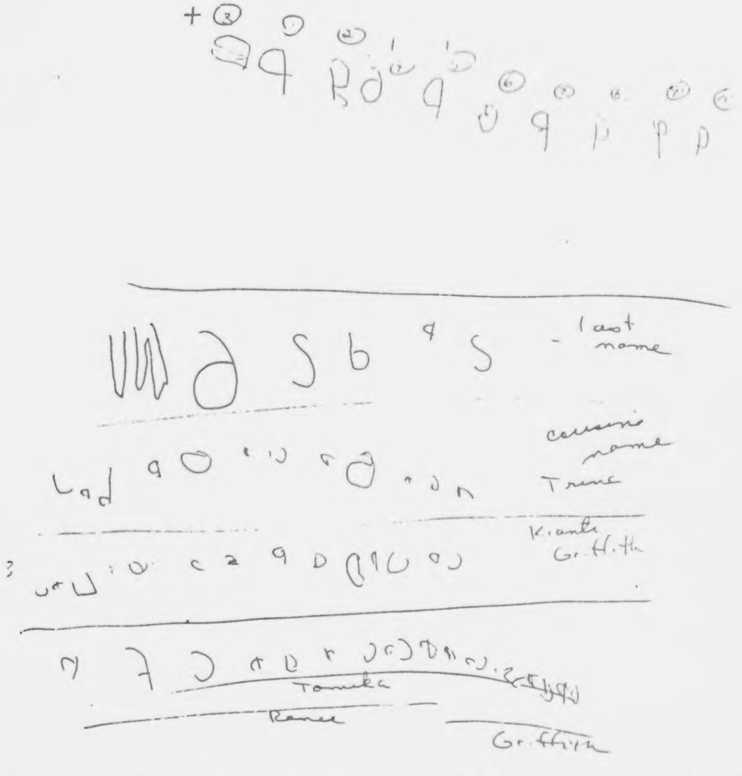

Figure 1. Response to spelling test and instruction to "write your name and anything else you can" by child with total score of 1.2 on Alphabetic Principle Task.

Table 1

Scale of Children's Conceptualization of Written Language

Level	Definition	Category
1	Line borders, picture-like scribbles, pictures, shapes	Drawing
2	Writing-like scribble, scribbles	Scribbles
3	Scribbles with letters, letter-like, and number-like forms	Letter-like, Number-like Forms
4	Pictures with embedded print; letters with numbers, strings of numbers	Letters Mixed With Numbers
5	Ungrouped letters, letter strings	Letters
6	Pseudowords, words	Words

Conceptions of Writing

This measure came about as data from the "Write Your Name and Anything Else You Can" task was analyzed. It became clear that information about the continuum of development would be lost if only children's grasp of the Alphabetic Principle was measured, since this understanding is, in a sense, the end point of this continuum. Thus, a scale of ways in which children conceptualized written language as a system was developed. The scale represents responses to the task which range from drawings to words (see Table 1).

A total score for each child was derived by scoring each display and averaging scores. The mean of the total scores was 3.66 ($SD = 1{,}72$). In general, children tended to understand that writing is in some way a different system from pictures but not entirely separate. They seemed to understand that writing involves certain abstract forms and approximated them through their scribbles. Their inclusion of numbers as part of this system was also apparent in the "Intentionality" task. A portion of responses made by a child receiving a composite score of 3.6 is in Figure 2.

Concepts About Print

Each child was given Clay's Concepts About Print Task—the *Sand* form (1979), having 24 items. Mean score was 6.67 ($SD = 3.58$). Compared to Clay's normalized scores on data from New Zealand children in 1968, the present subjects were below the average at roughly the 3rd stanine.

Intercorrelations Between Tasks

Since tasks represented different pieces of a whole, and a measure of their intercorrelations was desirable, a Pearson Correlation test was run (see Table 2).

DISCUSSION

One of the most vexing problems facing the educational establishment is the continued failure of low-SES children to attain literacy skills at levels comparable to

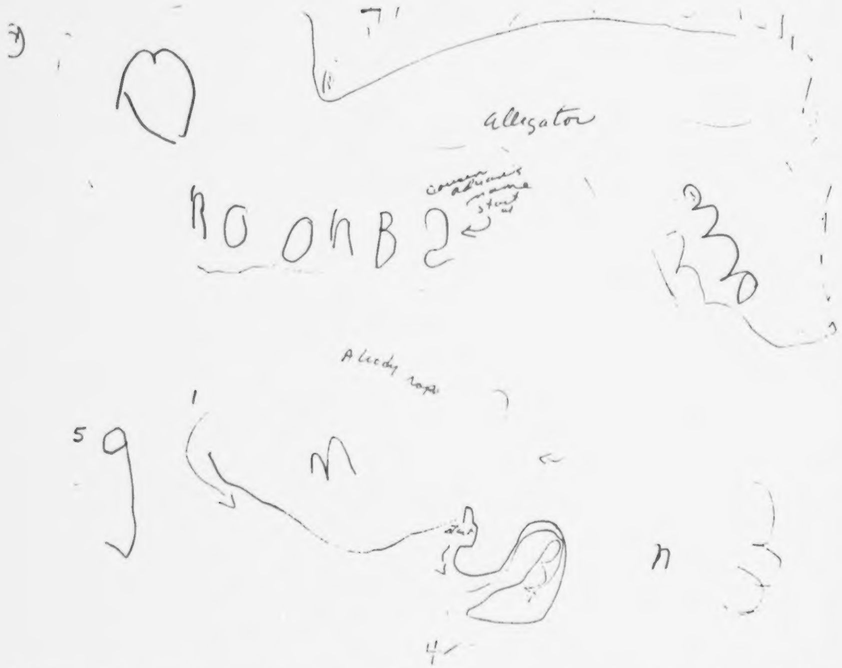

Figure 2. Responses representative of average score on Concepts of Writing assessment.

Table 2

Correlations Between Written Language Knowledge Tasks

Test	2	3	4	5	6
1. Intentionality	.54*	.36*	.32	−.06	.18
2. Story Structure		.42*	.18	.12	.13
3. Written Register			−.02	−.14	−.13
4. Alphabetic Principle				.41*	.46*
5. Concepts of Writing					.39*
6. Concepts About Print					

*Significant with $p<.05$.

their middle-class counterparts. Trying to tackle this problem at the classroom level is futile, it seems, without clear and specific information about schemata these children begin school regarding written language.

This is the first study known to the author to assess such a broad array of written language knowledges held by entering kindergartners, whether they be low-SES or middle-class. The immediate result is the inability to compare the findings as a whole to results of similar studies. Where possible (such as with the Written Register task), this was done. However, implications which are commonly drawn from emergent literacy studies (using smaller samples) indicate the average middle-class child enters kindergarten with a broader and deeper understanding of the facets of written language measured by tasks in this study. It remains for future research to confirm this.

Another caution to heed when interpreting data reported here is that not all low-SES in children have the same literacy experiences and thus enter kindergarten with the same level of knowledge about written language. The range of scores for the tasks verify this. However, the purpose was to portray the level of written language knowledge of this group as a whole since it is commonly recognized that, in general, children from low-SES homes have a more difficult time with attaining basic literacy skills than do middle-class children. Future analyses will look more specifically at higher and lower scoring children in relation to their school performance.

A final limitation is that tasks were conducted in school rather than in the children's natural world. This is especially pertinent to interpretation of responses to the Intentionality task. It very well may be that they gave school-related responses because they reasoned these were expected in such a context. However, data derived from other tasks tended to support our interpretation that the children possessed a limited schemata for the functions and forms of written language.

Results of the assessments, given this sample of randomly selected low-SES, inner-city children, indicate for the most part they possessed a very restricted view of written language. The overriding impression gained from extensive sessions with the children is that written language for them falls mainly within the province of school—it is for "school things" and it is for learning "school things." They seemed to think about written language on the letter—or piece—level and this appeared to fit their conception that written language is for school. The only other function they tended to express as meaningful for written language was that of the personal label, that is, use of names, and it was not clear that this function was meaningful outside of the schoolroom for these children.

Results of the Conceptions of Writing analysis together with results of the Alphabetic Principle Task indicate that, for the most part, children viewed written language as iconographic—whole signs for objects (mainly names) and not related to linguistic features in any sort of systematic way. Few evidenced implicit or explicit knowledge of the grapheme/phoneme relationship.

This is not to say that these children have not been exposed to their world and thus are inherently deprived or deficient in some way. Their responses to the environmental print task in the first and second conditions reflect their abilities to learn to read signs in their world. However, it was clear they had not moved into reading decontextualized print in any sort of way which would allow them access to the world of written language.

The overall low scores for story structure and written register reflect limited experience with written narratives—a finding of Teale's (1986) earlier account of literacy events in lower income homes. This is also reflective of the impression that these children view writing and reading as mainly school-type activities which they experience as "learning the letters" and "learning the ABCs". The ultimate *goal* of learning the letters in the minds of these children remains a question. If it continues to be just for "school things," one finds the persistent failure of these children at reading and writing to be more understandable.

Viewing correlations between different parts of written language knowledge provides another perspective on this data. Clusterings of intercorrelations indicate two independent domains of knowledge. One is represented by Intentionality, Story Structure, and Written Register tasks. Knowledge tapped by these assessments seems to be more closely at the text level and related to meaning. The other domain is more at the "innerworkings" (Dyson, 1982) level of written language knowledge and related more closely to writing as a symbol system.

Knowledge in the second domain is directly taught in primary-grade literacy instruction whereas knowledge in the first is for the most part assumed by teachers and curriculum. Implicit knowledge of intentionality of print, story structure, and linguistic register of written narrative is dependent on extensive exposure to written language in many different forms during preinstruction years. It is knowledge brought to school often to a greater degree by middle-class children than by low-SES, inner-city children.

This is suggestive of one explanation for failure of low-SES, inner-city children in literacy tasks. Future research may clarify the relationship between (a) an overall restricted knowledge of written language, and (b) this particular pattern of scores and success at learning to read and write in school.

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THE CONSTRUCTION OF KNOWLEDGE ABOUT WRITTEN LANGUAGE BY LOW-SES LEARNERS DURING THEIR KINDERGARTEN YEAR

Karin L. Dahl
University of Cincinnati

The failure of low-SES children in reading and writing is well documented. We know that these learners fail in disproportionate numbers in American schools (DeStefano, Pepinsky, & Sanders, 1982) and that their difficulties are apparent in reading and writing performance from the beginning of schooling.

Research has investigated these patterns by studying classroom instruction and noting the effects of grouping practices, instructional materials, and social contexts on learning to read and write (Au, 1980; Bloome & Green, 1982; Collins, 1981; Griffin, 1977). These investigations have described important instructional factors for low-SES children but have not included information from the learner's perspective—how children themselves go about making sense of their instruction in reading and writing.

This article focuses on one aspect of a comprehensive 2-year federally funded study investigating learners' development in reading and writing during the kindergarten and first-grade years. The study examined several aspects of children's early literacy growth. The researchers tracked reading and writing instruction of low-SES children in three urban classrooms for 2 years, assessed various kinds of knowledge about written language held by 36 randomly selected children from these sites at the beginning of kindergarten and the end of first grade, and recorded the sense-making behaviors during kindergarten and first grade of 12 randomly selected learners.

The focus of this article is on the latter portion of the study, the sense-making and interpretation of literacy instruction that was evident during the kindergarten year for the randomly selected focal learners. Our guiding question addressed how low-SES learners interpreted literacy instruction in light of their entering knowledge of written language. Patterns evident in the pretest information gathered at the beginning of the kindergarten year were used to organize and interpret trends in the sense-making data from across the kindergarten year.

The pretest data for this study reported proficiency levels on five tasks representing various aspects of written language knowledge. These included knowledge of (a) intentionality of print, (b) story structure, (c) written narrative register, (d) alphabetic principle, and (e) print concepts. A more detailed account of these tasks and the scoring procedures that were used has been published elsewhere (Purcell-Gates, 1989). Analysis of pretest data showed that these students generally held a restricted view of written language and regarded it as largely a school-centered activity. Their story retellings and invented stories included many fragmentary texts and their knowledge of "book language" was markedly lower than levels shown in previous investigations of well-read-to kindergarteners from lower-middle and middle-class children (Purcell-Gates, 1988). Understanding of the alphabetic principle was shown in a few cases to reach the prephonemic level, though most learners showed little grasp of phoneme/grapheme mapping. Finally, understanding of print concepts was below the average when compared to Clay's normalized scores on data from New Zealand (Clay, 1979). These general trends, while reflecting a range of knowledge, were taken to reflect limited experiences with written language prior to the kindergarten year (Purcell-Gates, 1989).

Given this general picture of written language understanding, the tracking of focal learners had two purposes. First, the researchers followed the ways in which focal learners interpreted or made sense of instruction in reading and writing during their kindergarten year. The researchers observed children's strategies for reading and writing as well as their ways of "doing school." Second, the researchers described the knowledge that focal learners constructed, that is, children's evolving hypotheses about reading and writing across the kindergarten period.

METHOD

Subjects

The subjects for this study were 12 low-SES children randomly selected from the sample of 36 learners receiving the array of pretests of written language knowledge. This subsample of 12 included 4 kindergarten children (2 boys and 2 girls) from each of three different classrooms in three inner-city elementary schools in a large metropolitan area in the Midwest.

All kindergarteners who were eligible for the free lunch program according to federal guidelines were placed in the pool of learners from which children were randomly selected for testing. Once the subset of 36 was identified for testing, the subsample of 12 was randomly selected for close observation. The researchers, in selecting this smaller subset, were able to gather more detailed and comprehensive information about each learner than would have been possible if all the tested children at each site had been tracked.

Sites

Each of the three sites selected for this study served children from economically poor families. In each school many families were supported by public welfare. Although all of the schools were part of the same school system, the three kindergarten classrooms were markedly different. The curriculum at site A involved extensive unstructured play with literacy materials (books, paper/pencil, art materials, and chalkboards) and a traditional reading readiness basal program. The teachers required children to read and copy a daily sentence which reported the day of the week and the date, for example, "Today is Tuesday, November 29, 19 --." There were relatively few story reading events in the classroom. Those that did occur involved older students reading orally to the class from their basal readers.

Site B, in contrast, used a synthetic phonics program which emphasized not only letter formation but extensive drill in letter/sound mnemonics. Students participated in choral drills where the teacher pointed to a card with a picture and corresponding letter and students recited the mnemonic for that letter/sound pairing, for example, "Capital L mixer /l/, /l/, /l/, /l/, /l/" and "Capital N motorboat /n/, /n/, /n/, /n/, /n/." The curriculum allowed almost no unstructured time, pencils were raised in unison, and learners were constantly directed in their actions by the teacher. Usually a daily storytime was part of the classroom routine.

The classroom program at site C was a traditional basal reading readiness program with primary emphasis on beginning sounds and letter recognition through skill lessons in workbooks and worksheets. Each day there was a storytime and questions were asked by the teacher during and after the story.

Data Collection

A team of three researchers gathered all data, logging a total of 347 hours of classroom observation across the three sites. Each researcher observed two or three full kindergarten sessions per week from October through May. Data gathering involved close, systematic, and persistent observation of focal learners with one researcher responsible for all of the data gathered at a specific site. Focusing on one learner at a time, the researcher sat physically close to the child being observed and probed about the child's activity while it was in progress. Questions such as "What are you doing now?" and "Tell me about this work" were used to elicit student explanations. Some recordings were made of student utterances using remote microphones with audiotape recorders and all papers that learners produced were copied as documentation of the day's classroom activity. Field notes included a detailed account of what the teacher did and said as well as focal learner behavior.

Data Analysis

Field notes were coded to establish patterns of learner behavior across the year. Codes included *asking questions, book handling, reading attempts* and so on for 52 categories of learner activity. These data were separated into two divisions, behavior which occurred in response to teacher-direction and behavior which was self-sponsored. (This division captured an early trend, namely that learners' self-sponsored activity differed in purpose from activity occurring during teacher direction.)

To focus on the hypotheses that children developed about reading and writing, field notes were analyzed for consistent patterns of behavior indicating what learners believed about written language. Where a number of similar instances were documented, the researchers counted the pattern as evidence of a hypothesis. For example, Maya, a learner in site A, spent a good deal of the year during self-sponsored activity writing and talking about the names of people in her extended family. Day after day she would write their names and then provide a running narrative about them. "This my mother's name," she would say pointing to the name Michelle, and "This my sister's name," pointing to the name Tamara. The researchers inferred, as these recurring instances were aggregated, that Maya believed that *print can convey the names of others*. For each site and each focal learner, researchers analyzed the data, listing in one column the prospective learner hypotheses and in the other the supporting evidence. Lists were then divided into periods of time so that patterns of development could be seen across the kindergarten year.

Using the scores obtained from the array of pretests, researchers then grouped learners according to their proficiency in written language knowledge. Pretest data indicated that although mean scores across the sample were generally low, they reflected a considerable range in performance. Some learners scored in a manner that reflected modest levels of written language knowledge while others showed little evidence of exposure to written language. Since the study focused on how learners made sense of their instruction in light of their written language knowledge, two clusters of students (average and low) were established to capture the differences in their levels of knowledge about written language.

RESULTS

Sense-Making During Reading and Writing

Contrasts between teacher-directed and self-sponsored activities across the three sites indicated marked differences in patterns of behavior. During teacher-directed activity, learners spent the bulk of their time following the teacher's directions. They copied letters, marked answers, and replied to the teacher's questions. Table 1 presents the most frequently occurring activities during teacher-directed instruction and indicates the percentages of each activity by site.

As can be seen, paper-pencil activities predominated during teacher-directed activity in kindergarten as learners were engaged primarily in skill and drill activities. Justin, a learner who easily understood the directions for each worksheet, often com-

Table 1

Most Frequent Learner Actions During Teacher-Directed Activity

Location	Learner Action	Percentage by Site
Site A	Copying sentences	32
	Marking workbook answers	27
	Reading attempts	23
	Responding to word questions	18
Site B	Copying letters	30
	Choral drill participation	24
	Writing letters	19
	Responding to teacher questions (letters)	14
	Tracing letters on paper	12
Site C	Marking answers on worksheets	32
	Responding to teacher questions (letters)	19
	Responding to teacher questions (sentences)	17
	Reading attempts	17
	Writing names	14

pleted not only his own ditto sheet, but his neighbors' sheets as well. His response to the teacher's query about who was finished was to point to the papers on either side of him and smilingly acknowledge that he had finished them all.

Interestingly, field notes indicated that learner strategies for performing these teacher-directed tasks included a variety of ways of "doing school," three of which were most prominent: (a) Many learners simply engaged in doing what the teacher said, that is, following the directions that were given; (b) in instances that were particularly repetitive, such as the choral drills about letter sounds or the routines involving the "Today is" sentence, the learner strategy was to simply go through the motions, paying just enough attention to stay out of trouble; and (c) the marking of answers was usually accompanied by wholesale copying from one's neighbor with the purpose being to replicate the spatial configuration of the answer rather than grasp why the right answer was correct.

During self-sponsored activity the emphasis shifted markedly. Instead of answering questions, the learners asked questions. They explored various aspects of reading and writing: wrote their names, handled books, wrote on the chalkboard or on paper, and talked about their problems with written language. Allen, for example, attempted to sort out his confusion about *M* and *W* and the sounds they made. One of his questions directed to the teacher was "*W* begins with *moon*?"

Maya used her free choice time to handle books and experiment with pretend reading. Often she simply looked at the print, and occasionally she not only told the story as if it were printed on the pages before her, but turned the book around as if to show the pictures to her imaginary audience.

Table 2 presents a listing of the more frequent learner actions during self-sponsored activity across the kindergarten year.

These data indicate learner involvement with written language, curiosity about reading and writing, and engagement in some way with the two processes when the activity was directed by the learners themselves.

Learners' Evolving Hypotheses About Reading and Writing

The second area of analysis addressed learners' hypotheses and contrasted beliefs about reading and writing as they evolved across the kindergarten year for learners with differing levels of knowledge about written language. It also contrasted hypotheses in relation to the curriculum in reading and writing at each site.

In the fall, hypotheses held by lower achieving learners showed a focus on letters themselves. Learners were interested in letter formation and struggled to identify and distinguish between various letters. Jamie, for example, spent one November afternoon writing and rewriting the letter *J*. He was not sure which way the curve went and erased every trial.

The average group, in contrast, seemed to concentrate on the functions of print and were interested in possibilities for literate activity within the classroom environment. Eric found the researcher's activity interesting. One particular day he assembled a make-do clipboard of paper over a hardback book and was poised with pencil ready to take "field notes." He followed the researcher around announcing matter-of-factly, "I'm writin' what you makin'," and scribbled his pretend notes.

Table 2

Most Frequent Learner Actions During Self-Sponsored Activity

Location	Learner Action	Percentage by Site
Site A	Writing names	30
	Writing words and letters	25
	Book handling	23
	Reading attempts	12
	Scribble writing	10
Site B	Book handling	21
	Asking questions	19
	Identifying letters	18
	Looking at print	14
	Writing letters	14
	Reading attempts	14
Site C	Asking questions	28
	Reading attempts	26
	Book handling	19
	Correcting others	13
	Scribble writing	5
	Writing names	5

As the year progressed, differences between activities chosen by groups of learners increased. The group with less knowledge of written language remained preoccupied with letters and letter formation and seemed primarily concerned with simply getting through the day, that is, doing the worksheets and other tasks required in their kindergarten classroom.

Mary Ann, for example, was just finishing a ditto page on *m* and *p* in which she was to glue pictures beginning with either of these sounds next to the corresponding letter. She responded to the researcher's query about what she was doing by answering, "Put a *b* or a *c*." Further conversation about how to accomplish the task and why she was doing it resulted in the explanation, "Cause you have to do it to go to first grade."

Within the same general period of time Ellen, a learner having more experience with written language, frequently created "books" during her free choice periods. She stapled together a group of pages and then wrote on each page a word or a grouping of letters. Ellen particularly liked to tell about each page. "That's just a word," she said pointing to ***Hrh*** in the center of the page. "And that's my name and that's letters," she added referring to *Ellen* and *t-o-r-i-a-n*.

Table 3 presents these contrasts and lists the learner hypotheses as shown by clusters of behavior for this mid-year period.

By the end of the school year the differences shifted again. Although the average group was beginning to explore strategies for reading, the lower group was preoccupied at the word level and was engaged primarily in copying written language rather than attempting to read. Tonya, for example, used the print around her to supply letters

Table 3

Contrasts in Hypotheses Held by Average and Low-Achieving Focal Learners Across Sites During the Mid-Year Period of Kindergarten

Hypotheses Held by Students with Average Scores on Measures of Written Language Knowledge	Hypotheses Held by Students with Lower Scores on Measures of Written Language Knowledge
Names stand for oneself and indicate ownership.	Letters are individual shapes which can be copied.
Print can convey the names of others.	The orientation of a given-letter can vary.
Written language is functional, appears in greeting cards and books.	Letters have specified names.
Letters can be incorporated with art.	Letters can be thought of as shapes.
Letters must be written in a prescribed way and can be distinguished from each other.	Letters must be written in a prescribed way and can be distinguished from each other.
Phoneme/grapheme relationships can be identified.	Phoneme/grapheme relationships can be identified.
The beginning sound of a word can be identified and mapped onto appropriate letters.	
Word boundaries are difficult to establish.	

she needed for various school tasks. When the lesson required her to write her name, she copied it letter by letter from her crayon box, reversing the letter *n*. A week later, while completing an assigned worksheet, she copied more print from the same source. She wrote *A4*, inverting the print from the crayon box cover.

During this end-of-year period, learners from the average group provided running commentaries about their reading attempts. Justin, for example, looked at a ditto page he had been given and stared for a moment. The page had a picture of a body of water and a place for the word *sea* printed below it (S--). Justin scratched his head muttering, "I know its an ocean, but it gots to begin with a S."

These shifts in focus and differences between the two groups are summarized in Table 4.

Two trends are evident in these end-of-year data: (a) a developmental difference in the focus of learner activity between the two groups and (b) an interest by the lower achieving group in the details of written language rather than its functions.

Learners' Hypotheses in Relation to the Curriculum

When hypotheses for all the focal learners were contrasted across sites, taking as salient those hypotheses held by most of the learners, another pattern became evident. Learner actions strongly reflected the curriculum they were experiencing. At site A,

Table 4

Contrasts in Hypotheses Held by Average and Low-Achieving Focal Learners Across Sites at the End of the Kindergarten Year

Hypotheses Held by Students with Average Scores on Measures of Written Language Knowledge	Hypotheses Held by Students with Lower Scores on Measures of Written Language Knowledge
The beginning sound of a word can be identified and mapped onto appropriate letters.	The beginning sound of a word can be identified and mapped onto appropriate letters.
Letters have specified names.	Wordness involves a sense that a word is composed of letters and has boundaries.
Words can be identified by sounding out the first part of the word.	Words can be written but must be spelled in specified ways.
Reading at the sentence level involves calling sight words in order.	Words, phrases, and sentences can be copied.
Books are pleasurable.	

where learners experienced play with literacy materials, learners experimented with various ways to read. There was evidence of eye/voice mapping and attempts to read environmental print. One day, for example, a sign appeared on a sink where students usually washed their hands. It read, "Hot water. Do not use." Maya was asked about the sign as she stood in front of the sink. She stared at the words then slowly read the message, pointing to each word as she pronounced it. "Hot . . . . water . . . . do . . . . not . . . ." The word *use* proved beyond her reach, though she worked on it silently for a while.

At site B, where the synthetic phonics program predominated, learners worked on written language in terms of letters—even their reading behavior related to letters. Brian was looking at a language experience chart he had copied about Easter candy when the researcher asked, "What do you think it says here?" He ran his finger under *we liked* and said "I don't know what that say." Then he pointed to the words *Easter bags* and, while referring to the wall cards with letters and sounds, said the letter names, "e, a, s, t, e, r, b, a, g, s."

At site C the traditional reading readiness curriculum was evident in the array of hypotheses about the alphabetic principle. Learner behaviors indicated understanding that phonemes could be mapped onto graphemes and that beginning sounds of words could be identified. Justin, for example, tried to read a bulletin board on the four food groups. He looked at the pictures under the sign that read *Bread and Cereal*, ran his finger under the phrase and read, "Bread." He continued in the same manner with each part of the display. Finally, he looked at the pictures and words for the last group, *Dairy Foods*. Not seeing an *m*, he said, "It doesn't say milk group."

Across the three sites, these analyses have delineated the strategies and hypotheses that were widely held across the kindergarten year. Three general findings are evident. First, when children engage in self-sponsored activity, they tend to explore written language by attempting the processes themselves. They handle books, tell a pretend text, or scribble write as they make various attempts at reading and writing. They ask questions about literate activity and their interactions and activities appear to be productive. Second, the hypotheses about written language held by focal learners who were the least advanced were focused on letters and on standards of correctness or accuracy, whereas the hypotheses of their more advanced counterparts focused on letter/sound mapping and attempts to read print, whether in books or in the environment. Third, these learners demonstrated that, for the most part, they concentrated on what the curriculum taught. If the curriculum led them to think about letters, they experimented with letters—if it provided experience in various ways to attempt reading, they explored the print around them and made various reading attempts.

DISCUSSION

The children were in many ways like those reported in other investigations of learners from low-SES groups (Anderson & Stokes, 1984; Ferreiro & Teberosky, 1982; Heath, 1983). Their entering knowledge of written language at the beginning of kindergarten reflected limited experience with written language and suggested a socially influenced view of literacy which regarded reading and writing as school-centered activities. Specifically, those with the least knowledge of written language at the beginning of schooling appeared to be dependent upon school for experiences leading to growth in literacy, and they appeared to make little progress. Learners with more knowledge of written language, in contrast, seemed to explore independently and move beyond the skill-centered emphasis of the traditional reading readiness curriculum. They explored reading and writing functionally and their progress was steady and promising.

These trends are supported by other studies with varying curricula which indicate ways that children learn, given their school experiences. Allen (1988) investigated the writing development of low-SES kindergarten learners in whole language classrooms with sustained daily writing about self-selected topics. She found that most children made progress regardless of where they started in either reading or writing. Allen attributed this progress to instructional experiences that supported the emergent literacy development of each learner regardless of his or her entering knowledge. Other instructional programs, such as the Literate Environment approach (Putnam 1981) used for Chapter 1 students in Philadelphia and the Kindergarten Emergent Literacy Program (Teale & Martinez, 1989), have also produced results that document sustained participation in writing and story reading activities for low-SES learners.

Thus, learners with the least knowledge of written language seem most in need of curricula which support their literacy growth by direct engagement with the processes of reading and writing. Without extended literacy experiences at home and in the community they are dependent upon the curriculum at school, not only for their understanding of reading and writing, but for their judgments of themselves as competent literacy learners. When the curriculum supports their emergent literacy development by engaging them meaningfully in writing and reading experiences (Allen, 1988; Putnam, 1981; Teale & Martinez, 1989), they appear to be successful and not confined by their initial inexperience with written language. When, however, their school curriculum is focused on the details of reading and writing without being preceded by a sense of what the processes are for or how they work, their progress is more problematic.

This kindergarten analysis addresses the data from the first half of the comprehensive study. As these learners proceed through the first-grade year, further analyses will reveal whether these early trends hold across the 2-year span, and whether the relationships evident in kindergarten shift as learners gain increasing knowledge of written language.

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SELF-PERCEPTIONS OF "AT RISK" AND HIGH ACHIEVING READERS: BEYOND READING RECOVERY ACHIEVEMENT DATA

Sheila G. Cohen
SUNY Cortland

Gloria McDonell
Fairfax County Public Schools

Bess Osborn
Sam Houston State University

This study looked at the impact of Reading Recovery on students' beliefs about their competence and capacity to direct their own learning activities. Causal attributions for success or failure (Weiner, 1972, 1979) and self-efficacy (Bandura, 1977), in other words, perceived competence to do various literacy activities, were selected as measures of these variables. Bandura has maintained that self-efficacy can be considered one's competence to accomplish a task. These self-appraisals affect a child's choice of activities and their effort and persistence (Bandura, 1977). Weiner (1972, 1979) also suggested that an individual's achievement behavior will be a function of the cognitive representation of related events, activated by a stimulus, that will produce an expectation of success and failure. That is, if one is successful in performing a task, one is more likely to attribute future success to ability or effort. Thus, successful experiences are likely to change children's belief systems such that they believe they are more competent, more in control, more likely to succeed with similar tasks and are more likely to be motivated to engage in similar learning activities.

Reading Recovery is a tutorial intervention program for at-risk first-grade students as well as an inservice training program for teachers (Clay, 1985). Students in this program work for 30 minutes each day with a teacher who has been trained to make accurate instructional decisions. The program goals are to teach students to understand the reading process, learn letter-sound relationships, and gain fluency through writing and reading of progressively more difficult text. Students are dismissed from the program as soon as they enter the middle reading group in their class, usually after an average of 18 weeks of instruction.

More than simply designed to raise levels of functioning in reading, the goal of Reading Recovery is to help students who are at-risk develop a self-improving system that enables them to self-monitor and solve their own reading problems by helping them discover strategies for themselves (Clay, 1972, 1985; Pinnell, 1985).

Unlike other intervention or remedial reading programs where dependence on others for learning is often a result, Reading Recovery seems to have an impact on achievement motivation in that it appears to facilitate a sense of increased ability and control over one's reading and learning (Clay, 1972, 1985). In an earlier investigation to document this claim within Social Cognitive Theory paradigms (Bandura, 1977; Weiner, 1972, 1979), Cohen, Cohen, McDonell, and Osburn (1987) conducted a study in which Chapter I Reading Recovery students were compared to other Chapter I students who were in a highly successful remedial program. The results indicated that both groups of first-grade children could make causal attributions and judge their own competence to do school related work. However, the Reading Recovery students more frequently attributed their success in various school tasks to their own ability and hard work and also expressed greater feelings of competence to carry out various reading and writing tasks in the classroom than did other at-risk students. In addition, anecdotal data from classroom teachers indicated that Reading Recovery students indeed did use independent strategies for solving their own reading problems.

In this study we attempted to examine the influence of Reading Recovery on children's self-perceptions by comparing Reading Recovery students not only with other at-risk students but with high-achieving students as well. We addressed the following specific questions: (a) Do Reading Recovery students attribute their success to ability, effort, mood, task difficulty, or teacher help more than other at-risk students and as often as high-achieving readers? (b) Do Reading Recovery students feel more competent to do reading and writing activities than other at-risk students and as competent as high-achieving readers?

METHOD

Population

Participants were 138 first graders in a predominantly upper middle-class school district outside of Washington, D.C. Ninety-eight of these students were at-risk and well below the SES of the majority of students in this district. Fifty were in Reading Recovery and 48 were in other remedial programs. The additional 40 students were high-achieving readers selected from the same schools as the at-risk students. The 98 at-risk students were identified for special services because they all scored below the 40th percentile on a standardized test at the end of their kindergarten year. Reading Recovery students were selected from the lowest scores and enrolled in that intervention program at different times during the 1987-88 school year. They were discontinued from the program after an average of 18 weeks because they were able to work within the middle reading group in their class and were felt to have acquired sufficient self-directed independent strategies to continue to improve in reading and writing on their own.

Students in the remedial program were provided daily instruction for 45 minutes in small groups of five or six. Reading specialists used an integrated language arts approach and students in this program typically make NCE gains well above the national average.

Materials and Procedure

Attribution was measured with a scale designed for our previous study (Cohen et al., 1987) using as a model the "What Kind of Student Am I?" scale developed by Cohen (1983). Four items were included, each of which specified a particular behavior in the stem and then required students to respond to each of five causal statements that completed the sentence. The four behavior stems were the following: (a) *Sandy usually finishes worksheets on time because;* (b) *Sandy usually follows directions for school work because;* (c) *Sandy usually figures out new words when reading because;* (d) *Sandy understands what she reads because.* The five causal attributions following each of the above stems read as follows: (a) *Sandy is smart most of the time;* (b) *Sandy works hard most of the time;* (c) *Sandy is in a good mood most of the time;* (d) *Sandy has easy work to do most of the time;* and (e) *Sandy gets help from the teacher most of the time.* The five causal attribution statements were to be rated either *not like me, a little like me,* or *just like me.* To assess the internal consistency of the scale Cronbach's alpha was computed. The standard item alpha was .81, indicating that this scale was fairly reliable.

The self-efficacy measure was developed using a method similar to that described by Schunk (1985). On the scale we created, there were seven statements like *I can read books by myself, I can read books to someone else,* and so forth (see Table 3 for all items); students were asked to respond *not often, sometimes,* or *always* in regard to each. Although this instrument was administered as a 3-point scale, it was modified when tabulating the responses, because we, as well as independent observers, agreed there was little or no difference between the first two categories (*not often* and *sometimes*). Because the internal consistency of this measure, computed with Cronbach's alpha, was .71, we collapsed the first two categories and treated this variable as nominal rather than ordinal. The attribution and self-efficacy scales were individually administered to all participants at the end of the 1987-88 school year by trained examiners.

RESULTS

To answer the first research question, means and standard deviations were computed for each of the attribution variables by group. These data are summarized in Table 1. Correlations were also computed between these independent variables (Table 2). Because these data indicated there was a moderate to strong relationship between these variables, a MANOVA was computed to determine whether there were differences between the three groups on the attribution scale. The MANOVA indicated that there were significant differences between the groups, $F(2, 135)=4.05$; $p>001$. Univariate ANOVAs indicated that there were significant differences for *effort, ability,* and *mood* but not for the other two attributions, *task difficulty* and *teacher help.*

To determine where the significant differences were, contrasts were computed. Results of these contrasts indicated that there were significant differences between Reading Recovery and other at-risk students on three of the causal attributions, *ability* [$F(1, 135)=14.56$; $p>.0001$], *effort* [$F(1, 135)=7.09$; $p=.009$); and *mood* [F(1,

Table 1

Means and Standard Deviations of Children's Attribution Scores by Group

	Other At-Risk[a]		Group Reading Recovery[b]		High-Achieving[c]	
Attribution	*M*	*SD*	*M*	*SD*	*M*	*SD*
Ability	2.34	1.98	2.64	1.37	2.76	1.09
Effort	2.45	1.83	2.67	1.47	2.78	1.29
Mood	2.45	2.34	2.66	1.55	2.62	1.83
Teacher Help	2.15	2.66	2.30	2.76	2.48	2.92
Task Difficulty	1.97	2.98	2.06	2.71	1.68	2.94

[a] *n* = 48. [b] *n* = 50. [c] *n* = 40.

Table 2

Interrcorrelations Among the Attributions

Variable	1	2	3	4	5
1. Ability	1.00				
2. Effort	.57**	1.00			
3. Mood	.62**	.64**	1.00		
4. Help	.25*	.24*	.23*	1.00	
5. Difficulty	−.10	−.14	.01	.04	1.00

Note. *n* = 137.
*$p < .01$. **$p < .001$.

Table 3

Proportion of "Always" Responses to Self-Efficacy Items by Group

	Other At-Risk[a]	Group Reading Recovery[b]	High-Achieving[c]
1. I can figure out new words by myself.	.29	.46	.59
2. I can write stories by myself.	.54	.68	.88
3. I can spell words by myself.	.44	.52	.56
4. I can write so someone can read it.	.56	.58	.83
5. I can read books by myself.	.56	.72	.95
6. I can read books to someone else.	.54	.72	.76
7. I do good work on my workbook pages.	.54	.62	.75

[a] *n* = 48. [b] *n* = 50. [c] *n* = 40.

135) = 10.39; $p>.002$]. Contrasts between Reading Recovery and high-achieving students indicated there were no significant differences on any of these causal attributions.

To answer the second question, the researchers calculated percentages of students in each group who responded *always* to the self-efficacy items. These percentages (Table 3) indicate a clear trend, with percentages of *always* responses higher for Reading Recovery students than for other at-risk students but lower than the percentage of *always* responses for high-achieving students.

DISCUSSION

Analysis of the attribution data indicated that Reading Recovery students more readily attributed their success in school to *ability*, *effort*, and *mood* than did the other at-risk students. When comparing Reading Recovery students with high-achieving first-grade readers, there were no significant differences found for any of the attributions. It would appear, therefore, that Reading Recovery students become much like the group of high-achieving students; in other words, their attributional patterns are similar, characterized by use of internal stable causes to account for achievement scenarios.

Responses on the self-efficacy scale revealed a trend in the predicted direction. Reading Recovery students responded *always* a greater proportion of the time to each of the self-efficacy items than the other at-risk students, but less often than the high-achieving readers. This is an indication that Recovery students feel more competent about their ability to do various reading and writing activities than the other at-risk students. There were substantial differences between the Reading Recovery students and the other at-risk students on five of the seven items. For those items where there were minimal differences (items four and seven), the nature of the Recovery program itself might explain this. Fewer *always* responses from Recovery students to item 4, *I can write so someone can read*, might be a reflection of the program emphasis on strategies for reading; writing strategies are fostered for understanding sounds in words, letter sequences, and so forth. Fewer *always* responses from the Recovery students in reaction to item 7, *I do good work on my workbook pages*, may also be attributable to the program. Recovery students are not trained to do workbook pages. The assumption is made that they will be able to do them and this is generally the case. However, after doing a great deal of real reading in the Recovery program, workbook pages may look tedious to these students.

What appears to be important about the findings, overall, is that Reading Recovery students, who were judged to be the lowest functioning students in the kindergarten population when they were selected for the program, not only could function in an average reading group after treatment, but appeared more like high-achievers in their attributions (ability, effort, mood, task difficulty, and teacher help). They also had scores that indicated they felt more competent on school-related tasks (self-efficacy) than the other at-risk students. They were, however, not as high on these items as the high-achieving group. With regard to self-efficacy, although it appears that students' beliefs about their competence for selected learning tasks increase, they are not as high as students who were initially high-achieving, which is not surprising. That Reading

Recovery students have self-learning strategies and continue to improve is an indication that the statistical differences are also real differences.

The study has a number of limitations. Selection of students is a problem in research such as this in that it poses a threat to internal validity, yet a great deal is learned when conducting research in real-life settings. Another limitation is that there is no way of knowing if the students' perceptions translate into self-directed learning behaviors in the classroom. Follow-up longitudinal studies using observational techniques and interviews need to be conducted to determine this.

This study suggests that the Recovery students perceive themselves to be competent and in control of their own learning, thus supporting the claims of Clay (1987). Based on studies reporting gains in achievement due to Reading Recovery (Clay, 1987) and the findings of this and a previous study (Cohen et al., 1987) suggesting Reading Recovery increases ability and effort attributions as well as self-efficacy, variables that have been demonstrated to mediate self-regulated classroom behavior and achievement motivation, it is suggested that educators consider adoption of this type of program for at-risk students.

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FACTORS ASSOCIATED WITH LONG-TERM READING ACHIEVEMENT OF EARLY READERS

John J. Pikulski
University of Delaware

Aileen Webb Tobin
U. S. Army Ordnance Center and School

This report represents the third and final phase of a study of children who learned to read prior to entering kindergarten. Phase 1 investigated factors associated with the phenomenon of early reading (Tobin, 1981). Phase 2 focused on whether early readers would maintain their reading achievement advantage through the elementary school years (sixth grade) when their achievement was compared to a carefully matched sample of nonearly readers (Tobin & Pikulski, 1988). Since the results of Phase 2 yielded clear results indicating early readers were superior in reading achievement, Phase 3 attempted to determine why the superior achievement was maintained.

A number of studies (e.g., Durkin, 1966; Briggs & Elkind, 1977; Clark, 1976; King & Friesen, 1972; Thomas, 1982) have investigated factors associated with early reading, but prior research has yielded inconsistent support for the conclusion that early readers maintain their superior achievement beyond the primary grades. Although the two best recognized longitudinal studies of early readers (Clark, 1976; Durkin, 1966) conclude that early readers maintain superior achievement, both were limited in that they did not constitute a well-defined control group. In addition, Clark's conclusions were drawn from general observations rather than actual achievement data. Given the existing documentation for the long-term achievement of early readers, it is not surprising that there is virtually no existing empirically derived description of factors associated with that achievement.

METHOD

Subjects

Our original group of *early readers* were 30 entering kindergarten children who had learned to read without benefit of formal, institutionalized instruction. This group was compared to a carefully matched group of *nonearly readers*. There was an equal number of males and females in each group and no statistically significant differences in mean IQ. Mean chronological age for the early readers was 66.3 months and 67.5 for the nonearly readers.

Sizeable differences in word identification between the two groups existed at the beginning of kindergarten, however. The early reading group could recognize an average of 37.6 words in isolation; the mean for the nonearly reader sample was 4.3. Mean Gates-MacGinitie Reading Tests grade equivalent scores for the early readers were: vocabulary, 1.8; comprehension, 1.7; and total reading, 1.7. This test was too difficult for the nonearly readers. More extensive demographic data for the two groups are found in Tobin and Pikulski (1988).

As many as possible of the original subjects were retested at four subsequent points: end of first grade, $n=23$ early readers and $n=24$ nonearly readers; end of second grade, $n=19$ early readers and $n=22$ nonearly readers; beginning of fourth grade, $n=17$ early readers and $n=15$ nonearly readers; and end of sixth grade, $n=23$ early readers and $n=25$ nonearly readers.

Although all subjects did not participate in each phase of the study, there were no statistically significant differences in the initial verbal intelligence scores of the early and nonearly readers at any checkpoint. Therefore, it appeared safe to conclude that any differences found between the groups were not due to fluctuation in the intelligence of the early and nonearly reading samples (see Tobin, 1981; Tobin & Pikulski, 1988).

Materials

Descriptions of tests administered in Phases 1 and 2 of the project are reported in Tobin (1981) and Tobin and Pikulski (1988). In the present study, Phase 3, the following measures were used.

Parent questionnaries. To determine variables that might account for differences in achievement of the two groups, questionnaires were administered to subjects' parents at each checkpoint. Parents rated the overall quality of their child's instructional program and the amount of emphasis it placed on the development of various reading skills; they also provided information about the child's attitudes toward reading, type of parental assistance offered, and amount of time the family devoted to other activities that could be expected to help develop reading skills.

At the end of sixth grade, subjects were also administered three supplemental measures to gain further information that might help explain differences in the long-term achievement of the two groups. These were the following.

Peabody Picture Vocabulary Test (PPVT) Dunn and Dunn (1981). An earlier version of the PPVT had been administered to subjects at the beginning of kindergarten. Readministration of this test would determine if there were changes in the early and nonearly readers' verbal skills, as reflected in vocabulary development.

Informal measure of knowledge of children's literature. Parent questionnaires suggested that the early readers had engaged in more independent reading than the nonearly readers; however, this was a "soft" form of documentation. Therefore, a two-part informal measure of knowledge of children's literature was constructed to obtain another measure of independent reading.

Part I consisted of brief descriptions of 25 books that had been recipients of the Newbery Award for children's literature. Books were chosen based on availability, recency, and researchers' judgments about their popularity. Subjects were directed to read descriptions and match these with titles of 30 Newbery Award winners listed on a separate piece of paper. Part II consisted of 10 items, each of which presented a list of three books written by the same author. Each author was judged by the researchers to be popular with sixth-grade students. Subjects were asked to read each item, review a list of 15 authors, and match the group of books with their author.

The underlying assumption in administering this test was that if the early readers were more knowledgeable of children's literature, they were likely to have done more independent reading. The question of whether the early readers did significantly more independent reading was of interest in and of itself. In addition, the research literature (Stanovich, 1986; Anderson, Wilson, & Fielding, 1988) suggests that independent reading can have a significant effect on achievement.

Informal attitude survey. The researchers constructed an attitude survey for use at end of sixth grade consisting of 28 statements classified into three categories: "General Attitudes toward Reading" (15 items), "Emotional/Affective Responses" (6 items), or "Parental Involvement." Examples of each type of item are as follows:

General Attitudes
  I buy books with my own money.
  When riding in a car, I read a book.
Emotional/Affective
  I feel sad when reading a really sad book.
  When I am reading, I feel that what's happening to the characters could be happening to me.
Parental Involvement
  My parents tell me I have to read a book.
  My parents buy me books.

The examiner read each item aloud and directed the subjects to indicate whether the statement described something that, based on their personal experience, was "often," "sometimes," or "hardly ever" true. Although the parent-questionnaire data did not reveal differences in the early and nonearly readers' attitudes toward reading, it did not seem reasonable to conclude the study without attempting to obtain a more direct measure.

Procedure

Almost all tests and questionnaires were administered at the University of Delaware, however, a few children were tested in their homes. The Gates-MacGinitie Reading Tests and informal measure of children's literature were administered by the authors or trained assistants either on an individual or small group basis. All remaining instruments were individually administered.

RESULTS

For results of Phases 1 and 2, see Tobin (1981) and Tobin and Pikulski (1988). Results of the present study are reported below.

Vocabulary Development

Table 1 reports PPVT scores of early and nonearly readers who participated at the end of sixth grade as well as the results of *t* tests comparing their performance at the beginning and end of the study. Although these results revealed a statistically significant difference ($p<.005$) favoring the early readers at the end of sixth grade, a supplemental *t* test comparing the early readers' initial and final PPVT scores did not provide any evidence to suggest that there was statistically significant improvement in the overall level of their vocabulary development, $t\ (22)=1.72$, $p>.05$, two-tailed.

Knowledge of Children's Literature

A one-way multivariate analysis of variance (MANOVA) with two dependent variables (titles, authors) and a two-level between subjects factor (group) was performed to determine if there were differences in early and nonearly readers' knowledge of children's literature. The multivariate test for equality of group means led to a rejection of the null hypothesis, $F(2, 45)=9.83$, $p<.0005$; inspection of univariate tests indicated that there was a statistically significant difference in the performance of the two groups on each subtest. As Table 2 shows, the early readers' scores were consistently higher than those of the nonearly readers; both differences were significant at the .05 level or beyond.

Attitudes Toward Reading

Table 3 summarizes the results of the informal attitude survey. Higher scores represented more favorable attitudes toward reading, more active involvement in the reading process, or greater parental involvement in reading-related activities. General Attitude, Emotional/Affective Response, and Parental Involvement subscores were derived by adding the scores assigned to the items falling in the corresponding categories.

A one-way MANOVA using these subscores as the dependent variables and group as two-level between subjects factor revealed that there was no statistically significant differences between the two groups' responses to the survey, $F(3, 44)=1.48$, $p>.05$. However, although it was not appropriate to perform the corresponding univariate tests, inspection of the mean scores on the individual items indicated that the early readers' ratings were generally slightly higher. The only notable exceptions to this trend were the subjects' responses to those items focusing on parent involvement: these items suggested that parents of nonearly readers were less likely to think of reading as a recreational activity. It appeared that the nonearly readers' parents were more inclined to *check* their homework and *require* them to read books.

Multiple Regression Analyses

To determine the variables that might explain why early readers were able to maintain their advantage, two additional stepwise regression analyses were performed at the conclusion of each progress assessment checkpoint. In one analysis, the subjects' total Gates-MacGinitie Extended Scale Scores (ESS) was used as the dependent variable; in the other, an informal measure of reading achievement was the criterion.

Table 1

Mean Peabody Picture Vocabulary Test Standard Scores of Early and Nonearly Readers Who Participated in the Study at the End of Sixth Grade

Date Administered	Early Readers ($n=23$)	SD	Nonearly Readers ($n=25$)	*SD*	t (two-tailed)
Beginning of Kindergarten	120.26	13.39	116.32[a]	8.48	1.22*
End of Sixth	126.65	12.35	116.32	12.05	2.93**

[a] Nonearly readers' initial scores were adjusted for regression to the mean since this sample was chosen based on their PPVT scores and their uncorrected scores were in excess of the population mean, $M = 100$.

*$p<.05$. **$p<.005$.

Table 2

Mean Raw Scores of Early and Nonearly Readers on Informal Measure of Children's Literature Administered at the End of Sixth Grade

Subtest	Early Readers ($n=23$)	*SD*	Nonearly Readers ($n=25$)	*SD*	Univariate F
Part I: Title of Newbery Award Winners	9.4	4.4	5.8	4.7	7.17*
Part II: Authors of Popular Books	7.0	1.6	4.5	2.2	20.03**

*$p<.05$. **$p<.0005$.

Table 3

Mean Subscores of Early and Nonearly Readers on the Informal Attitude Survey Administered at the End of Sixth Grade

Item Category	Early Readers ($n=23$)	*SD*	Nonearly Readers ($n=25$)	*SD*
General Attitudes toward Reading	33.5	5.2	30.9	4.2
Emotional/Affective Responses	14.8	2.5	13.6	2.6
Parental Involvement	11.4	1.9	11.9	2.1

Because of space limitations, only the results of those analyses using the individually administered, informal reading tests are included. Results obtained using the Gates-MacGinitie Reading Tests varied somewhat, but were generally similar to those obtained with the informal measures. Tables summarizing the results from all regression analyses are available from the authors.

As indicated in Tables 4–6, there were some obvious similarities across the three analyses performed at the end of first, end of second, and beginning of fourth grades. Despite differences in the number of variables in the predictor pool, each analysis yielded a multiple correlation coefficient of at least .78 suggesting that early readers had maintained their advantage largely because they had the benefit of an early start and an early interest in independent reading. In all three analyses, these variables were able to account for at least 43% of the total variance in subjects' current reading achievement. However, although none of the remaining variables was able to account for more than 7% of the variance in the criterion measure, two analyses suggested that early readers were less likely to receive help in completing their homework assignments and two suggested possible instructional influences.

Likewise, the regression analysis performed at the end of sixth grade yielded a relatively large correlation coefficient ($r = .59$) and suggested that early readers' initial advantage and independent reading might play a significant role in long-term achievement. As shown in Table 7, 35% of the total variance in the subjects' current reading achievement could be explained by initial word recognition scores and familiarity with Newbery Award books.

Table 4

Stepwise Regression of Reading Achievement on Parent Questionnaire Data Using End-of-First-Grade Instructional Reading Level as the Dependent Variable and Beginning-of-Kindergarten Word Recognition as the Covariate

Independent Variables[a]	*R*[b]	R^2
1. Covariate: Beginning-of-kindergarten, word recognition (raw scores)	.68	.46***
2. Home activities, first grade: Amount of time child devoted to independent reading (Positive *r* suggests that high achievers devoted more time to this activity than their peers.)	.76	.58**
3. Parents' perception of the child's first grade instructional program: Vocabulary development (Positive *r* suggests that parents of high achievers were more likely to feel that their child had received adequate instruction in this area.)	.79	.62*
4. Home activities, first grade: Amount of time parents devoted to helping their child with homework assignments (Negative *r* suggests that parents of high achievers tended to devote less time to this activity than their counterparts.)	.81	.66*

Overall *F* (4, 36) = 17.52***

[a] Predictors are listed in the order they entered the analysis. [b] $n = 41$.
*$p < .05$. **$p < .005$. ***$p < .0005$.

Table 5

Stepwise Regression of Reading Achievement on Parent Questionnaire Data Using End-of-Second-Grade Instructional Reading Level as the Dependent Variable and Beginning-of-Kindergarten Word Recognition as the Covariate

Independent Variables[a]	*R*[b]	R^2
1. Covariate: Beginning-of-kindergarten, word recognition (raw scores)	.69	.48***
2. Home activities, first grade: Amount of time child devoted to independent reading (Positive *r* suggests that high achievers devoted more time to this activity than their peers.)	.80	.64**
3. Home activities, second grade: Amount of time parents devoted to helping their child with homework assignment (Negative *r* suggests that parents of high achievers tended to devote less time to this activity than their counterparts.)	.84	.70*

Overall $F(3, 31) = 24.09$***

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[a] Predictors are listed in the order they entered the analysis. [b] $n = 35$.
*$p < .05$. **$< .005$. ***$< .00005$.

Table 6

Stepwise Regression of Reading Achievement on Parent Questionnaire Data Using Beginning-Fourth-Grade Instructional Reading Level as the Dependent Variable and Beginning-of-Kindergarten Word Recognition as the Covariate

Independent Variables[a]	*R*[b]	R^2
1. Covariate: Beginning-of-kindergarten, word recognition (raw scores)	.42	.17*
2. Home activities, first grade: Amount of time child devoted to independent reading (Positive *r* suggests that high achievers devoted more time to this activity than their peers.)	.66	.43**
3. Parents' perception of the child's first grade instructional program: Inferential comprehension (Positive *r* suggests that parents of high achievers were more likely to feel that their child had received adequate instruction in this area.)	.78	.60*

Overall $F(3, 22) = 11.11$***

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[a] Predictors are listed in the order they entered the analysis. [b] $n = 26$.
*$p < .05$. **$p < .005$. ***$p < .0005$.

DISCUSSION

This paper focuses on the final and most speculative phase of a longitudinal study of children who learned to read before they entered kindergarten. Unlike earlier phases of the research, it relied almost exclusively on retrospective data from parent question-

Table 7

Stepwise Regression of Reading Achievement on Parent Questionnaire Data, Vocabulary Development, Knowledge of Children's Literature, and Attitudes Toward Reading Using End-of-Sixth-Grade Informal Reading Comprehension as the Dependent Variable and Beginning-of-Kindergarten Word Recognition as the Covariate

Independent Variables	R^b	R^2
1. Covariate: Beginning-of-kindergarten, word recognition (raw scores)	.48	.23**
2. Informal literature measure: Recognition of Newbery Award winners (Positive *r* suggests that high achievers tended to be familiar with more of these books than their counterparts.)	.59	.35*
		Overall $F(2, 43) = 11.65$***

^{a}Predictors are listed in the order they entered the analysis. $^b n = 46$.
*$p<.05$. **$p<.005$. ***$p<.0005$.

naires and, therefore, has some clear limitations. However, given that the overall study is based on a comparatively large sample of early readers, includes a carefully matched control group, and provides what appears to be the best available documentation of the long-term benefits of early reading achievement, some tentative conclusions seem warranted.

When we initially decided to study the long-term achievement of the early and nonearly readers, we had anticipated that the achievement advantage of the early readers would diminish with each year of testing. This hypothesis was derived from a developmental stage theory (Chall, 1983). Such a theory, while viewing the basic processes involved in reading as being the same at all stages of development, suggests that the control of certain processes is of paramount importance at specific stages. According to developmental stage theory, the major task facing beginning readers is the acquisition of an efficient stfategy for translating printed language into language that is already familiar and meaningful. However, through repeated exposure to printed language, children are expected, fairly early, to develop automaticity of decoding; beyond the stage of developing automaticity, prior knowledge and overall language/concept development are seen as the prime determiners of reading achievement.

In this longitudinal study, we attempted to match the early and nonearly readers for language/concept development using the Peabody Picture Vocabulary Test. When the study was initiated at the beginning of kindergarten, we hypothesized that the only major difference between the two groups was that the early readers were well into the decoding stage of reading whereas the nonearly readers had not yet entered that stage. We further hypothesized that as the children in both groups achieved automaticity of decoding, perhaps by fourth, certainly by sixth grade, and as language/concept factors became the predominant influence, the achievement of the two groups would converge and differences would become insignificant. However, the achievement data failed to support these predictions; the early readers were significantly superior in achievement at every data-gathering point (Tobin & Pikulski, 1988).

Based on these results, we now feel that a developmental stage theory, by itself, is insufficient for predicting long-range achievement and that an important force that needs to be integrated into adequate explanation is what Stanovich (1986) has termed "Matthew Effects." This term refers to the concept that organisms of differential advantage are "exposed to non-random distributions of environmental quality" (p. 360). Stanovich provides well-documented arguments to suggest that superior readers do more independent reading; this, in turn, helps them build larger stores of knowledge and vocabulary. As a consequence, the wider range and depth of prior knowledge and language skills they have acquired not only provide a basis for higher achievement, but also encourage greater independent reading because such reading can be done with greater facility. Less accomplished readers, who are less facile in reading, read less both independently and during instruction, and therefore, build less background and language skills which, in turn, are not particularly conducive to greater independent reading. In other words, the rich get richer and the poor get poorer.

Our results offer support for Matthew Effects. The regression analyses did suggest that first-grade independent reading was a contributing factor to the superior reading achievement of the early readers. However, this may simply be a reflection of the fact that, in first grade, nonearly readers were essentially unable to do independent reading.

Stronger evidence of greater independent reading on the part of the early readers comes from the measure of knowledge of children's literature administered at the end of sixth grade. Early readers scored substantially higher than the nonearly readers on both sections of this measure.

The hypothesis that "Matthew Effects" were operating to perpetuate the superior reading achievement of the early readers also receives support from results of the Peabody Picture Vocabulary Test. Although the difference in the mean performance of the two groups on this measure was not statistically significant at the beginning of kindergarten, it was significant at the end of the sixth grade. Although there was an improvement in the early readers' scores between kindergarten and sixth grade, the difference was not statistically significant. Thus, there is some basis, but no clearcut empirical evidence, to suggest that superior vocabulary growth may have been an important contributing force to the superior achievement of the early readers. Limitations in the PPVT may have contributed to the lack of statistical significance. Future research needs to consider the use of more extensive and sensitive measures of vocabulary development.

Analyses of parent-questionnaire data collected at the beginning of kindergarten indicated that the parents of nonearly readers seemed to rely on more formal assistance in helping their children learn to read, whereas the parents of the early readers used more informal, spontaneous forms of support; it seems possible that this distinction in the support the two groups of parents provided may have persisted as their children grew older, and contributed to the long-term achievement differences of the early and nonearly readers. For example, although the results of the informal attitude survey administered at the end of sixth grade failed to show significant differences between the groups, there was a pronounced trend for nonearly readers to report that their parents actually supervised homework assignments and *required* that they do recreational reading, again suggesting more formal parental assistance.

Likewise, open-ended items to parent questionnaires administered at the beginning of fourth grade seemed to suggest that the early readers tended to devote more time to independent reading because they had the benefit of parents who informally encouraged them to think of reading as a recreational activity. When asked to suggest improvements in their child's instructional program, only 13% of the early readers' parents suggested it should place more emphasis on independent reading while 47% of the parents of nonearly readers indicated that their children could benefit from additional independent reading assignments.

There were also suggestions from the questionnaire data that the parents of early readers were more consistent and persistent in encouraging independent reading. At the end of sixth grade, parents were asked to identify those things in the home that had the greatest influence on their child's reading ability; although 89% of the early readers' parents suggested that they were still actively engaged in informal activities that could be expected to promote interest in reading, most of the parents of nonearly readers attributed their influence to the early stages of the child's development and only 32% related they were currently involved in activities similar to those of early readers' parents.

In summary, earlier phases of this study have provided some clear suggestions about those factors which are conducive to early reading and strong evidence for the long-term superior achievement of early readers. Though more speculative in nature, this final phase of the study suggests that greater amounts of independent reading may play a crucial role in promoting the long-term benefits of early reading achievement and that differences in vocabulary development may play a mediating role. Unfortunately, this study did not systematically investigate school factors, but it did suggest that parents may play a crucial role in long-term superior achievement by informally and consistently encouraging independent reading.

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THE EFFECT OF TWO TRAINING PROCEDURES ON THE BOOK READING OF LOWER-SES MOTHERS AND CHILDREN

Patricia A. Edwards
Michigan State University

Carolyn P. Panofsky
Rhode Island College

Research has shown that book reading is not the primary literacy event that lower SES mothers are likely to share with their children (Anderson & Stokes, 1984). Instead, researchers have found that lower SES mothers provide their children with considerable experience with print other than in books, for example, in print-related activities such as paying bills, doing crossword puzzles, reading the television guide, reading the rules for parlor games, Bible reading, reciting the alphabet, and naming family members (Anderson & Stokes, 1984). Although these activities do indeed help lower-SES children in their progress toward becoming literate, they are not "the ones typically focused on when the child's preparation for school is considered" (Anderson & Stokes, 1984, p. 24). Yet experience with books is strongly considered when evaluating a child's readiness for school. As Anderson and Stokes point out, "one predominant source of poor school performance of lower [SES] children is considered to be lack of experience with books" (p. 24). Writers such as Clark (1983) have argued that schools must forge partnerships with families to promote literacy and success in school learning. Parent-school partnerships may begin to address literacy during the preschool period by focusing on storybook reading.

Unfortunately, when mothers of lower-SES children participate in book reading interactions with their children, they are less effective in book reading than middle-SES mothers (Ninio, 1980). When Snow and Ninio (1986) compared these mothers with middle-class mothers, analysis of bookreading interactions revealed that low-SES mothers lacked skill in eliciting active labeling from their infants and that this "had probably resulted in the latter, already at 19 months, having less firmly established productive vocabulary than high-SES infants of the same age" (p. 121). In addition, lower-SES mothers do not ask questions (Ninio, 1980) and do not view their children as appropriate conversational partners (Heath, 1982a, 1982b).

Over the last few years, several studies have addressed lower-SES mothers' participation in bookreading (Heath, 1982b; Heath & Thomas, 1984; McCormick & Mason, 1986; Ninio, 1980; Snow & Ninio, 1986). Until recently, however, few studies have recommended strategies for improving parental participation in this activity (Edwards, 1989; Edwards & Weems, 1988; Swift, 1970). The recurring finding from these studies is that if lower-SES mothers are shown how to share books with their young children and are provided with successful models of bookreading, they are better able to help their children grow toward literacy. Chapman (1986) also reminds us that "when parents encourage their children to function as readers during book reading, expecting progressively closer approximations of reading behavior, children grow toward literacy" (p. 25).

We know that both parents and children benefit when they receive assistance in how to participate in effective bookreading interactions (Edwards & Weems, 1988). Although programs like Head Start have always focused on parent involvement as an important element in children's learning, they have rarely engaged parents and children in book-related activities. Rather, parents have been asked to participate in noninstructional activities such as assisting as classroom and playground monitors, serving as chaperones, helping with school programs and field trips, or they have been invited to attend seminars on parenting issues. Although these activities get parents involved with school, they do not support parents in promoting the literacy development of their children.

In an attempt to promote lower-SES parents' understanding of book reading as the school-preferred approach to becoming literate in our society, we decided to involve Head Start mothers in an exploratory short-term book reading study. We wanted to find out whether short-term interventions could have any effect, and what factors might be relevant to that effect. We used two approaches for introducing the Head Start mothers to book reading. One has been used in many parent education programs; it stresses the importance of reading to preschoolers, and focuses on what children learn from literacy experiences, while treating the interactions during these exchanges as "givens" (Heath & Thomas, 1984). We called this first approach the *importance condition*. We wanted to compare this popular approach with an alternative which relied on recent analyses of parent-child bookreading interactions and focused on familiarizing mothers with *how* to share books with children by presenting them with models of bookreading interaction and by highlighting important features of the modeled activity. We called the second approach the *modeling condition*.

METHOD

Participants

The home community of the participants in this study is a small town of approximately 10,000 located in a rural section of southeastern Louisiana. A large portion of the population is black, with many residents who are economically disadvantaged. There are high rates of illiteracy and teen pregnancy in the community; many students drop out of school after the middle years or in early high school.

The first author, a black researcher, had been serving as a consultant to the target Head Start program, conducting workshops in parent involvement. She was well-known to the program families and was viewed as an "insider" by them. Through the director of the Head Start Center, parents were informed that the consultant was planning a study about reading and preschoolers which needed volunteers. The announcement, presented in both written and oral form, specified that participation would involve the following: (a) being interviewed about home literacy practices and educational background, (b) being videotaped reading and puzzle-solving with their child, and (c) participating in group meetings about reading to preschoolers. Persons interested in volunteering knew they would be expected to participate on three occasions over a 1-month period.

Fourteen lower-SES Head Start mothers and their 4-year-old children participated. Five of the mothers were white and nine were black. Roughly half of the black mothers and half of the white mothers were randomly assigned to the two training conditions. Seven were assigned to the importance approach and seven to the modeling approach.

The average years of schooling of the mothers was 10.4 years. One mother had completed the 5th grade, two the 9th grade, five the 10th grade, and six the 12th grade. None was employed outside the home, and all were of low income or on welfare. Half of the mothers were married; the others were living in single-parent arrangements. These demographic data were obtained during interviews conducted prior to the first taping session.

Procedures

Training consisted of three 1-hour sessions for each group. In the *importance condition* training involved discussions of the importance of literacy in the mothers' lives and the importance of reading to children. In the first session, participants viewed a commercially prepared videotape titled *Drop Everything and Read* (Getz, 1986) featuring a number of well-known people talking about the importance of reading to children and showing children being read to. Discussion of the tape followed. The second session focused on understanding the development of literacy, described various types of children's books, and explained the relationship between different kinds of books and development. The third session addressed the question "Why read aloud to children?" and involved parents in discussion of their home literacy activities.

In the *modeling condition* training centered on videotaped and live modeling of bookreading strategies. Each session presented strategies and models of bookreading which have been identified by researchers (e.g., Cochran-Smith, 1984; Doake, 1985; Flood, 1977; Ninio & Bruner, 1978; Panofsky, 1987; Snow, 1983). Resnick and his coworkers (1987) have organized these strategies into four large categories: (a) body management, (b) book management, (c) language proficiency, and (c) attention to affect. Training for the modeling condition included several strategies from each category. For example, earlier observations of other parents at the same Head Start Center had found some parents seated the child and held the book in an orientation which did not allow the child to visually explore or touch the book, so body management and book management strategies addressing these matters were modeled and discussed. Earlier observations had also found some mothers read without asking questions or commenting on text, without any variation of reading intonation, or without responding to children's comments or questions, so verbal and affective responses were presented. Bookreading interactions were modeled on videotape or live by the leader/researcher and significant features explicitly discussed to make sure mothers noted them. (In contrast, although many of these features were present in the commercial videotapes played for the importance condition, they were not explicated as models during those sessions.) Some highlighted features showed the adult seated so the child could view the book, drawing a child's attention to the book, pointing to pictures and words, labeling and describing pictures, varying the reading intonation, and adjusting language to the child's level of understanding.

Amount of training time for the two conditions was the same, and both approaches combined visually and verbally presented information. However, the modeling approach presented more visual material, including live demonstrations carefully coordinated with verbal explanations so that participants were guided in what to attend to when they viewed the taped or live modeling and demonstration. All sessions were conducted by the first author.

Mothers in each group were videotaped in a puzzle-solving and reading session prior to training to observe baseline functioning and, after the second and third training sessions, to examine the effects of the two training conditions. In each taping session, each mother-child dyad solved one puzzle and read one storybook. The puzzle-solving task was included as a "warm-up" time for the participants to settle into the activity and to accustom them to being observed. The puzzle and story combinations were rotated to eliminate the confounding of an ordering effect.

Scoring

All bookreading interactions were coded using a scheme developed by the second author (Panofsky, 1987, 1989). In this scheme the utterance of each speaker receives a functional and a speech act designation. The speech act categories, similar to codings in other studies of book reading interaction (e.g., Snow & Ninio, 1986), include initiations and responses, with initiations further divided into questions and comments; repetitions are coded as responses. The functional categories are divided on several levels: the first distinction is between utterances which are or are not event-related; event-related utterances are further divided into activity-related utterances and text-related utterances. Activity-related utterances (similar to "relational" utterances in Halliday's [1975] functional analysis) are further divided into regulatives which involve getting the activity going and interactional monitors which maintain or repair the interaction. Text-related utterances (similar to "ideational" utterances) in Halliday's work) are of six kinds: referentials, which label or interpret pictures; procedurals, for focusing the other's attention on some aspect of the text or some procedure for making sense of the text; inferentials, for commenting or questioning beyond the text; emotives, for expressing and identifying feelings; imaginatives, for acting out an imagined role; text-recitations, for reciting already-read or anticipated text.

In addition to coding the utterances of all participants, a propositional analysis was made for each of the three storybooks used during the sessions. The quantitative results of the coding were divided by the number of propositions in the text to yield a rate for the various tabulations. In an earlier study using these procedures, reliabilities of .94 for functional analysis and 1.00 for propositional analysis were obtained (Panofsky, 1987). Given this earlier reliability and the exploratory nature of the present study, coding was conducted only by the second author.

RESULTS

Effect of the training procedures was first assessed by looking at the maternal initiations across sessions. In Table 1 results are presented for average rate of event-related maternal initiations for the three sessions. (Note that the participants are reduced from initial group sizes: data from two dyads were dropped because their level of functioning prior to training was higher than all others following training, and interview data suggested they had a different pattern of home literacy activity from the others; data from two other dyads were dropped because they only participated in baseline sessions.) These numbers represent the number of initiations per proposition made during each reading, averaged across all mothers at a session. A 1.00 would represent one initiation per proposition of text. The stories used for the study *Bears in the Night* (Berenstain, 1971), *Just for You* (Mayer, 1975), and *Three Little Kittens* (Galdone, 1986), presented about two propositions per two-page spread.

As the results show, the mothers in the importance condition were functioning at a slightly higher rate prior to interventions. Mothers in both groups increased their level of initiations during the study, but the modeling condition shows a more pronounced effect. Due to the small sample sizes, analysis of variance was not conducted. However, variances for each of the six sessions were inspected to discover if one or two extreme cases accounted for observed differences. Variances for the two groups were quite similar except at the last session, when the variance for the modeling condition was considerably larger: all but one of the mothers in the modeling condition were functioning higher than any of the mothers in the importance condition, except for one who was functioning lower than any in that condition. The one low functioning mother, however, did initiate three times more utterances than in the previous two sessions. Thus, the greater variance resulted from one low-functioning dyad.

Next, we divided the initiations into questions and comments. Table 2 presents

Table 1

Maternal Initiations per Proposition by Session

	Session 1	Session 2	Session 3
Modeling ($n=5$)	.44	.47	1.32
Importance ($n=5$)	.56	.71	.79

Table 2

Maternal Questions and Comments by Session

	Questions			Comments		
	S1	S2	S3	S1	S2	S3
Modeling	.11	.19	.73	.33	.28	.58
Importance	.24	.43	.49	.32	.29	.31

these results. As the results show, mothers in the modeling condition increased both their questioning and commenting across the sessions, with the most pronounced rise in questioning. Mothers in the importance condition increased only their level of questioning, and the rise was far less pronounced than for the mothers in the modeling condition.

Next we asked about the occurrence of the various functions. Ninety-five percent of the functions in all sessions were accounted for by referentials and procedurals, with referentials accounting for an average of 54% and procedurals an average of 41%; for both functions, the two groups differed by only 2%. We tabulated the functions separately and examined their rates across sessions for each group. Tables 3 and 4 present results for referentials and procedurals.

There was a relatively large increase in the initiation of referentials per proposition by mothers in the modeling condition, especially between sessions 2 and 3. There was no change between the first two sessions for mothers in the importance condition, and a negligible increase between sessions 2 and 3.

There was a relatively modest rise in number of procedurals used by mothers in the modeling condition, and a slightly larger increase by the mothers in the importance condition. Comparison with data presented in Table 3 shows that in the second and third sessions mothers in the importance condition used roughly equivalent numbers of referentials and procedurals, and a greater number of procedurals than mothers in the modeling condition, although, as Tables 1 and 2 had shown, their overall level of initiations was lower.

Thus far we have ignored the role of children in these interactions. But if the training can be said to have any meaningful effect on the mothers' behavior, it must be in terms of children's participation. We examined initiations and responses of the children; Table 5 presents results of this analysis across all sessions.

Levels of participation of children were extremely low. As a consequence, numbers presented are raw averages unadjusted for propositional length of the stories. Thus, in session 1 none of the children in the modeling condition made any intitiations,

Table 3

Maternal Initiations of Referential Utterances

	Session 1	Session 2	Session 3
Modeling	.138	.150	.950
Importance	.326	.320	.348

Table 4

Maternal Initiations of Procedural Utterances

	Session 1	Session 2	Session 3
Modeling	.178	.212	.266
Importance	.150	.354	.365

Table 5

Child Initiations and Responses Across Sessions

	Initiations			Responses		
	S1	S2	S3	S1	S2	S3
Modeling	0.0	.8	.7	1.2	5.4	10.7
Importance	1.4	3.0	3.0	6.8	6.6	6.5

whereas children in the importance condition made an average of 1.4 initiations during the entire reading of the story. Pattern of change in initiations is relatively minor for both groups, though greater for those in the importance condition, whereas pattern of change in responses is relatively dramatic for children in the modeling condition, but unchanged for the others. In addition, most of all children's responses were referentials. In the third session, 86% and 87.5% of children's responses in the importance and modeling conditions, respectively, were referentials.

DISCUSSION

Mothers in the modeling condition appear to have increased their level of initiatives, primarily in use of questions, but also in use of comments, and the primary function of these changes was referential. Overall, children's participation levels were quite low, but one dramatic change was in the responding of children in the modeling condition, and almost all their responses performed the referential function.

These results are based on a small number of subjects and a limited amount of bookreading activity. Obviously, the results can be only suggestive. Several things seem important about the target activity: mothers increased their initiations and, in particular, their questioning, and children responded by answering their questions—something they were not doing in the first session.

Use of questioning is a way of drawing children in and involving them in an activity, promoting active rather than passive participation. Success of this maternal strategy is seen in the children's greatly increased response rate in the modeling condition. By bringing children into the activity in this way, mothers may be opening up the zone of proximal development (Vygotsky, 1978), involving children in the active construction of textual and pictorial meanings. Referential utterances comprising most of the mothers' questions and children's responses are used when joint attention is focused on a picture and new information is being added. Specifically, referentials include labeling pictures, specifying attributes, and interpreting pictures in the sense of constructing conventional (rather than personal or subjective) interpretations of pictures. Evidence from previous research establishes that children do need to be aided in interpreting pictorial representations (Panofsky, 1986). Also, previous research has shown that referentials are the first function that emerges in bookreading interactions observed in nightly book reading in home settings of children aged 2 to 6 (Panofsky, 1987). In longitudinal observations it was found that parents finely tuned their interactions with their children, carefully monitoring this aspect of vocabulary and concept learning before extending a significant portion of their attention to procedurals, inferentials, and other functions.

It may be that a modeling approach that actually shows parents what to do and how to interact around books promotes more actual interaction during book reading between mother and child participants than an importance approach. The current study was conducted over a brief time period. To address the question fully would require studying the interaction of more participants, observing longer bookreading sessions, and over a significant period of time. Ultimately, the question is whether such a parent-school partnership program seems to promote children's success in school. Supporting development of finely tuned interaction between parent and child around the school-related task of book reading is a way of addressing this concern.

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VARIABLES ASSOCIATED WITH SECOND-, FOURTH-, AND SIXTH-GRADE STUDENTS' ABILITY TO IDENTIFY POLYSYLLABIC WORDS

John Shefelbine and Luci Lipscomb
University of Texas

Alison Hern
Round Rock School District

Syllabication, ability to read words by breaking them down into pronounceable units, is generally regarded as an important word identification strategy. Effectiveness of syllabication instruction, on the other hand, has not been clearly demonstrated in the relatively few studies that have been done (Canney & Schreiner, 1977; Cunningham, Cunningham & Rystrom, 1981; Groff, 1971; Johnson & Bauman, 1984; Spache & Spache, 1973). Researchers have attributed these disappointing results to theoretical and practical problems associated with rules for dividing words into syllables. Common concerns include instructional procedures requiring students to pronounce words before dividing them, lack of theoretical support for dictionary rules for syllabication, low utility of some rules, and number and complexity of rules taught by some approaches. Johnson and Baumann (1984) concluded that further research is needed.

Our own work is based on a theoretical model of syllabication greatly deemphasizing the importance of rules for dividing words and that, instead, stresses (a) ability to read syllables automatically (at sight); (b) identification, in a flexible manner, of likely patterns of units in polysyllabic words; and (c) presence of the unknown word (or words with similar patterns) in the reader's oral vocabulary. In a simplified version of how these components interact when reading words out of context, students identify possible units within a word, relying mostly on familiar syllable letter patterns but figuring out unknown or rarer units when necessary. They quickly identify and combine units in a flexible manner until a match is made with a word in their oral vocabulary.

In the present study, we explored the proposed model of syllabication in terms of word identification ability of students in grades two, four, and six. We examined how four components of the model (syllable identification, syllable automaticity, syllable pattern identification, and oral vocabulary) relate to students' ability to read polysyllabic words in isolation.

THEORETICAL BACKGROUND

Skilled Readers and Syllabication

Skilled readers do identify words by breaking them down into syllables. Studies in this area have been most recently reviewed by Adams (in press). In particular, she cites work by Mewhort and his colleagues (Mewhort & Beal, 1977; Mewhort & Campbell, 1981), which she summarizes as follows:

> Mewhort's cumulative results inarguably indicate that skilled readers parse long words to syllabic units *during* visual scanning, not afterwards. Furthermore, they do so *in the course* of identifying the individual letters of a word, not afterwards. They do so automatically; the process is not under conscious control. They do so for pseudowords as well as real words. And their ability to perceive longer letter strings depends upon such instantaneous syllable parsing. (Sec. III, Ch. 2, p. 20)

Poor decoders, on the other hand, have a difficult time reading long words even when they can read single-syllable words (Just & Carpenter, 1987; Samuels, LaBerge, & Bremer, 1978).

Syllable Automaticity

Two variables of the model, syllable automaticity and syllable identification, emphasize the importance of being able to identify or pronounce syllabic units in isolation. It is intuitively obvious that students must be able to identify or "read" possible syllabic units; just locating them is not enough. Also, it is noteworthy that all or most successful syllabication instruction studies reviewed by Johnson and Baumann (1984) included atttention to syllabic units. Cunningham (1975, 1979) taught students to use familiar words to identify unfamiliar one- and two-syllable words. Gleitman and Rozin (1973) taught a simple syllabary to kindergartners.

Other support for including syllabic-unit variables in our model is found among linguists who (a) agree that only certain combinations of vowels and consonants are permitted in English syllables and (b) generally support existence and utility of open or free-vowel syllables (e.g., *mo*) and closed or checked-vowel syllables (e.g., *om*) (Groff, 1971). Ability to identify open and closed syllables enables students to pronounce frequently occurring units and should help them perceive likely units without aid of division rules.

Distinction between syllable automaticity and syllable identification is analogous to one made between automaticity and word identification (see LaBerge & Samuels, 1976). *Syllable automaticity* entails pronouncing syllables quickly or instantaneously with low attentional demands. *Syllable identification* involves ability to figure out unfamiliar syllables using similar words and phonic patterns; these strategies may take time and may require some attention.

The model hypothesizes that syllable automaticity is by far the more important of the two variables for skilled readers. Theoretical support is at least indirectly provided by studies indicating skilled readers quickly identify individual syllables while "reading" long words (Mewhort & Beal, 1977; Mewhort & Campbell, 1981). At the single syllable level, this entails a relatively complex process in which associations within frequent letter patterns allow immediate, effortless recognition of syllables and words (see Adams, in press). While some spelling patterns involve entire syllables which occur frequently (such as certain affixes), other patterns involve probable or likely (or permissible) spelling patterns for syllables or words that are not so common.

We are *not* suggesting that students simply learn a limited set of syllables (à la the Dolch list of basic sight words). Such an interpretation is incorrect for at least two reasons. First, there are too many syllables (over 5,000 according to Adams). Second, as pointed out by Adams (in press), a sequence of letters which may be a syllable in one word (e.g., *par* in *partial* and *partake*) may not be a syllable in another word (e.g., *par* in *partly* or *parade*). Syllabication is more than identifying a set of memorized syllables.

Syllable identification, while not as central as syllable automaticity, is included in the model because it is a precursor variable enabling development of automaticity, and it acts as a backup when a spelling pattern is not familiar or when syllable automaticity is generally low.

Syllable Pattern Identification

This variable involves ability to identify and combine likely syllable units when they are strung together in a polysyllabic word. The model suggests that students quickly arrive at likely patterns primarily by using knowledge of spelling patterns. Although some patterns involve entire units that frequently occur in words (e.g., affixes), others are dependent on the frequency with which certain strings of letters occur (Adams, in press). Because more frequent letter patterns tend to occur within and not across syllable boundaries, interletter associations automatically pull syllables apart. For example, since *d* is 40 times less likely to be followed by an *n* than an *r*, skilled readers perceive a syllable boundary between *d* and *n* in *Sidney* but not between *d* and *r* in *children*. Adams emphasizes that whether letters will be "pulled" together or apart depends on the relative strength of interletter and spelling pattern associations. Whether a string of letters is a syllable is dependent on letters surrounding them. Thus, syllable pattern identification is a variable including more developed and complex knowledge of letter patterns than the knowledge needed for reading single syllables in isolation.

We suspect flexibility is a component of processes used by students reading unfamiliar, long words. Different possible syllable units may be tried and combined until there is a reasonably close match with a word in the reader's oral vocabulary.

Oral Vocabulary Knowledge

The first three variables in the model are decoding skills. Oral vocabulary knowledge, the fourth variable, is included because it logically contributes to successful syllabication. Syllabication skills and strategies we have described (as well as more traditional approaches) at best can only produce an *approximate* pronunciation of a word. Since matching these pronunciations with real words in the reader's oral vocabulary is an important part of the process, the model predicts that students with larger vocabularies will be more successful at reading less common words than students with smaller vocabularies. For example, among students who have never heard of the word *feminine*, a pattern beginning with an open syllable sounds just as viable as one beginning with a closed syllable.

METHOD

Participants

Twelve classes (four per grade) were selected from Grades 2, 4, and 6 in three schools (one middle school, Grades 6–8, and two of its elementary "feeder" schools, Grades K–5). The schools were in an urban school district and contained a heterogeneous mixture of higher and lower achieving students (approximately 50% Anglo, 30% Mexican-American, and 20% Afro-American). There were 227 students in all. Classes for gifted students and for very low achieving students were not included. Means (and standard deviations) of raw scores for the Woodcock Reading Mastery Tests word identification subtest (Woodcock, 1987) and the Stanford Achievement Test vocabulary subtest (Gardner, Rudman, Karlsen, & Merwin, 1982) respectively were 55.0 (8.6) and 25.9 (4.7) across the four classes in Grade 2 ($n = 77$), 71.9 (9.0) and 24.9 (6.4) for Grade 4 ($n = 79$), and 76.2 (10.2) and 24.3 (6.7) for Grade 6 ($n = 71$). The first two grades were somewhat above national norms; the sixth grade was somewhat below. The study took place during the middle of the school year.

Measures

The dependent variable, identification of real polysyllabic words, was measured by combining raw scores on two wide-range tests of word identification. One was the San Diego Quick Assessment (La Pray & Ross, 1969); the other, the word identification subtest of the Woodcock Reading Mastery Tests. Although both tests were administered as prescribed, single-syllable words were not included in the analyses.

The four independent variables represented the four variables in the syllabication model. Syllable identification and syllable automaticity were assessed by combining two tests. One was the word attack subtest of the Woodcock Reading Mastery Tests, a list of single- and multisyllable pseudowords that increase in difficulty. Only the 32 one-syllable words were involved in measuring these two variables. We also developed a test in which students read (a) 5 open and 5 closed syllables in mixed order (e.g., *naf, ni*), (b) 10 prefixes, and (c) 10 suffixes. We included open and closed syllables because linguists generally accept them as useful aspects of syllabication (see Groff, 1971). We were interested in the one-syllable affixes, which also fall within the area of structural analysis, partly because we suspected students might be more successful and automatic in identifying these, given their higher frequency of occurrence. *Syllable automaticity* was measured by noting how many single-syllable units in the two tests were read correctly at sight (within a second). *Syllable identification* was measured by number of syllables on the same tests read correctly but *not* at sight (longer than a second).

Syllable pattern identification involved students reading polysyllabic words on two tests. The polysyllabic pseudowords on the word attack subtest of the Woodcock Reading Mastery Tests were one measure. We also constructed a test consisting of 10 two- and three-syllable nonsense words made up of open and closed syllables (e.g., *fimmo, fudlempo*) and 12 two- and three-syllable pseudowords made up of affixes and roots (e.g., *covade, nonjectous*).

Oral vocabulary knowledge was measured via the auditory vocabulary subtest of the Stanford Achievement Test, selected because it is given orally and hence does not penalize students with decoding problems. This was the only test not administered individually.

ANALYSIS

Quantitative analyses examined relationships among the four independent variables and the one dependent variable using multiple correlations and multiple regressions. The three grade levels were analyzed individually and as a group.

Although polysyllabic pseudowords on the Woodcock word attack subtest were scored according to criteria in the manual, more liberal criteria were used for the test we made up. Several possible pronunciations were counted as correct. For *zenug*, for example, we decided the *e* could be long, short, or, if unaccented, a schwa and *u* could be short or, if unaccented, a schwa.

RESULTS

Correlations among the independent and dependent variables showed oral vocabulary knowledge was most strongly associated with polysyllabic word identification (the dependent variable) and is a more important factor in grades four and six than in grade two (see Table 1). Syllable automaticity and identification of syllable patterns were significantly related to word identification and were also significantly related to one another. These latter interrelationships were expected since the two variables build upon each other and entail related decoding skills.

Syllable identification, which by definition involved taking time to read syllables, was negatively correlated with polysyllabic word identification, syllable automaticity, and syllable patterns.

Contrasting regressions of variables in the model indicated syllable automaticity, syllable pattern identification, and vocabulary knowledge, the three main variables in the model, all contribute significantly to successful identification of polysyllabic words (see Table 2). The role of syllable identification is less clear. Although this variable may well be an important precursor to syllable fluency, it is apparent that students who need time to figure out individual syllables probably will have difficulty reading multisyllable words.

DISCUSSION

Results supported the major components of the syllabication model. Syllable automaticity, syllable pattern identification, and oral vocabulary knowledge were

Table 1

Correlations Among Variables in the Model

	Syl Iden	Syl Auto	Pattern Iden	Word Identification
Grades 2, 4, & 6 ($N = 227$)				
Vocabulary	.002	.212***	.251***	.315***
Syl Iden		−.619***	−.262***	−.411***
Syl Auto			.786***	.786***
Pattern Iden				.807***
Grade 2 ($n = 77$)				
Vocabulary	.109	.136	.217*	.252***
Syl Iden		−.601***	−.076	−.302**
Syl Auto			.697***	.837***
Pattern Iden				.829***
Grade 4 ($n = 79$)				
Vocabulary	−.155	.347***	.385***	.580***
Syl Iden		−.482***	−.027	−.152
Syl Auto			.721***	.647***
Pattern Iden				.700***
Grade 6 ($n = 71$)				
Vocabulary	−.121	.415***	.416***	.669***
Syl Iden		−.512***	−.330**	−.339**
Syl Auto			.804***	.779***
Pattern Iden				.786***

*$p < .05$. **$p < .01$. ***$p < .001$.

significantly related to students' ability to read polysyllabic words. Problems with multicollinearity make it difficult to determine exact contributions of these variables to polysyllabic word identification. Still, it is encouraging that relationships generally remain significant even after some variance shared with other variables is partialed out.

Syllable Automaticity

As predicted by the model, automaticity seems to be an important factor for successfully reading polysyllabic words. This probably is because level of automaticity indirectly reflects letter- and spelling-pattern knowledge that enables students to efficiently perceive and read syllables within words. Students who were not "automatic" were at various stages of learning basic decoding skills. Some could successfully identify words and single syllables but needed time. Presumably, extensive practice using these single-syllable identification strategies will develop automaticity and knowledge of letter patterns. Other students, however, could not independently identify simple syllables (e.g., *sut*) or real words. Their word identification knowledge was marginal and, in a few cases, very limited.

Table 2

Contrasting Regressions of Components of the Model with the Identification of Real Polysyllabic Words as the Dependent Variable

Variable	R	R^2	Change in R^2
Grades 2, 4, & 6 ($N=227$)			
Order One			
Syllable Automaticity	.786	.617	.617***
Syllable Pattern Iden	.843	.711	.094***
Vocabulary	.851	.723	.012**
Order Two			
Syllable Automaticity	.786	.617	.617***
Vocabulary	.800	.640	.023***
Syllable Pattern Iden	.851	.723	.083***
Grade 2 ($n=77$)			
Order One			
Syllable Automaticity	.837	.701	.701***
Syllable Pattern Iden	.905	.819	.118***
Vocabulary	.908	.825	.007
Order Two			
Syllable Automaticity	.837	.701	.701***
Vocabulary	.849	.721	.019*
Syllable Pattern Iden	.908	.825	.105***
Grade 4 ($n=79$)			
Order One			
Syllable Automaticity	.647	.418	.418***
Syllable Pattern Iden	.729	.532	.114***
Vocabulary	.795	.631	.100***
Order Two			
Syllable Automaticity	.647	.418	.418***
Vocabulary	.750	.562	.143***
Syllable Pattern Iden	.795	.631	.070***
Grade 6 ($n=71$)			
Order One			
Syllable Automaticity	.779	.606	.606***
Syllable Pattern Iden	.824	.679	.073***
Vocabulary	.893	.797	.118***
Order Two			
Syllable Automaticity	.779	.606	.606***
Vocabulary	.867	.751	.145***
Syllable Pattern Iden	.893	.797	.046***

*$p<.05$. **$p<.01$. ***$p<.001$.

Syllable Pattern Identification

The unique variance explained by this variable suggests that some students who were able to read single syllables at sight still had difficulty reading strings of syllables. Adams (in press) attributes this to less developed knowledge of letter patterns necessary to detect syllable boundaries. We informally tested this possibility by seeing if students had greater difficulty reading strings of nonsense syllables (e.g., *fudlempo*) than strings made up of affixes and roots (e.g., *proserience*). This was the case. Paired *t* tests for each grade indicated both two- and three-syllable nonsense strings were significantly more difficult than pseudowords composed of affixes and roots ($p < .001$). This probably occurred because the latter patterns were more familiar to inexperienced readers.

Boundaries also seemed harder to establish in longer words. Paired *t* tests for each grade indicated that two-syllable strings were significantly easier than three syllable strings ($p < .001$).

Exactly how syllables are identified is a matter of debate. Adams (in press) maintains the relative strength of interletter associations plays a major role in determining syllable units. In a different approach to this problem, Taft (1979, 1987) has investigated an orthographic, morphological process or "rule" for identifying the first syllable of *real* words. He proposes that skilled readers "include in the first syllable as many consonants following the first vowel of the word as orthotactic factors will allow without disrupting the morphological structure of that word" (Taft, 1979, p. 24). The resulting syllable is called the Basic Orthographic Syllable Structure (or BOSS). Support for the BOSS has been inconsistent (Rayner & Pollatsek, 1989). Taft's work may not be applicable to the present study because our measures of syllable pattern identification involved nonsense words and pseudowords.

Oral Vocabulary Knowledge

Vocabulary was a stronger variable in grades four and six than in grade two. Possible reasons for this are: (a) many second graders are still learning to decode and cannot always arrive at pronunciations that are close to a word they know, and (b) rarer and, therefore, unknown vocabulary is more common in Grades 4 and 6.

We are aware that vocabulary knowledge can indirectly reflect amount of reading practice, knowledge of academic language, background knowledge, and intelligence. Although these factors may affect students' ability to read words, it was apparent that students who parsed words sensibly and adequately had difficulty giving correct pronunciations simply because they had never heard of the words before. A practical implication of this relationship is that teachers must evaluate whether limited oral vocabulary knowledge contributes to a student's poor performance on a test that ostensibly measures decoding. Similar distinctions should be made during regular instruction when students have trouble reading complex words in textbooks.

IMPLICATIONS

This study suggests that a well-developed, fluent knowledge of likely spelling patterns in individual syllable units and in multisyllable strings may be an important component of syllabication. "Sounding out" syllable elements or entire words in a less than automatic manner clearly is something skilled readers do not do; nor does this approach seem to help poorer readers. Fluency (or automaticity) is a key factor.

Whether and how syllabication can be *taught* is a critical question that remains to be answered. Although the present study did not address this issue, it does suggest directions for intervention studies. First, it is helpful to view syllabication as a higher "level" skill involving well-learned, rather complex knowledge of letter and spelling patterns. As such, we suspect that other kinds of knowledge are prerequisite to the development of syllabication. These prerequisites probably include automatic knowledge of (a) letters, (b) sound relationships (phonemic awareness) and letter-sound relationships, and (c) some generalizations, especially for open and closed single-syllable patterns.

Second, developing automaticity or fluency in reading real, one-syllable words should help students be aware of letter and spelling patterns that occur in multisyllable words. We recommend (a) giving students extensive practice reading simple stories and (b) making sure they have prerequisites that allow them to figure out unknown words independently.

Third, as students become fluent reading real words some may need short but frequent lessons in reading nonsense syllables and common affixes and roots. Since most syllable units are not real words, we need to be sure students can comfortably and quickly read these less common patterns and units.

Finally, as students become fluent readers of single-syllable units they probably will benefit from practice identifying likely syllable patterns in unfamiliar, polysyllabic words. They need to be aware that syllable units vary according to relative strength of letter patterns in words. This last step is dependent upon previous steps.

We have translated these suggestions into an intervention program for students who have difficulty reading long words. Preliminary analyses indicate that thirty 10-minute lessons significantly affected performance of students in Grades 2, 4, and 6.

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A STRUCTURAL APPROACH TO DECODING AND SPELLING

Marcia K. Henry
San Jose State University

Robert C. Calfee and Robin Avelar LaSalle
Stanford University

In this paper we describe research on an alternative approach to curriculum and instruction in decoding and spelling for regular, learning-disability and second-language classrooms. The work builds on the concepts from Project READ (Calfee & Henry, 1985) which promotes the notion that language is a tool for problem-solving and communicating.

Decoding comprises the skills and knowledge by which a reader translates printed words into spoken form or some equivalent thereof. Decoding is often taught as a set of performance skills while spelling is taught as a rote memory task. Rarely are both decoding and spelling taught simultaneously. Yet, they are related, as they both share a common orthography (Bryant & Bradley, 1980; Henderson, 1980). Our thesis is that these domains have to be grounded in a reflective understanding of the structure of English orthography, which in turn must be grounded in the history of the English language. Reflection in this model is supported by a simple structural framework for organizing complexities of English letter-sound correspondences, along with a technical language for thinking about and discussing the structure.

Four themes guide the present study. First, the *historical/structural framework* undergirds the design of assessment, curriculum, and instruction. History has influenced the English orthography over centuries stemming from the introduction of letters and words from diverse origins. English is a polyglot, with Anglo-Saxon, Romance, and Greek all major sources of the current vocabulary (Balmuth, 1982; Hanna, Hodges, & Hanna, 1971; Nist, 1966). Venezky (1970) showed that morphemes as well as phonemes and syllables play leading roles in the English orthography, whereas Calfee and Drum (1986) categorized letter-sound correspondences.

The second theme views decoding as a *separable component*, one of four distinctive elements in modern literacy. The gist of the separable-process assumption is that although the reading process may appear quite complex, the underlying structure is quite simple when students have been taught to see the "chunks" (Calfee, 1981). According to the separable-component hypothesis, understanding is more likely to be acquired when the teacher focuses on the component during clearly defined times during the school week.

Theme three, *metaknowledge*, enters because an integral part of the thesis is that students understand better when they are led to reflect on the structure of English orthography. Metacognition is the individual's ability to reflect on and monitor cognitive activity (Flavell, 1977). The dramatic findings in comprehension (Palincsar & Brown, 1984) provide an analogy for decoding strategies in the present study. Metalinguistic awareness (the ability to think about and reflect upon the nature and function of language as defined by Pratt & Grieve, 1984), and metalanguage (the language used to describe language—terms like phoneme, word, phrase, as noted by Tunmer & Herriman, 1984) also play an integral part in the instructional component of the study.

The fourth theme centers around *coherent and explicit instruction with active student participation*. *Direct teaching* coupled with *small-group discussion* is at the core of the READ model.

EFFECTS FOR STUDENTS IN REGULAR CLASSES

The first study (Henry, 1988) investigated what children from regular classes in the middle and upper elementary grades knew about the structure of words and how strategic instruction influenced their decoding and spelling performance.

Preliminary Assessment

In the first phase of the study, 443 students in Grades 3, 4, and 5 in 24 classes in six schools took a group-administered instrument (Henry, 1984) to determine their word structure knowledge. The instrument asked students to identify consonants, vowels, blends, consonant digraphs, vowel digraphs, compound words, prefixes, roots, suffixes, and syllable patterns within words. In addition, they matched dictated words in a multiple-choice array (word recognition task) and spelled words from dictation. Word items were taken from words of Anglo-Saxon, Romance, and Greek origin, whereas structural characteristics reflected the major structural categories (letter-sound correspondences, syllable patterns, and morpheme patterns).

Regarding word structure knowledge for the sample as a whole, performance on the subtests varied widely. Within the letter-sound correspondence category only the vowel subtests were well known by students. Most children could identify the constituent words in compound words and recognize the correct spelling for a dictated word (reading). In contrast, students had little understanding of the common syllable or morpheme patterns.

Intervention

Following the preliminary assessment, teachers from eight READ classes (4 third grade and 4 fifth grade) taught 164 students five specially designed decoding/spelling units based on word structure and word origin. The instruction (a) organized letter-sound correspondence information, (b) reviewed and introduced syllable patterns, (c) provided a historical background for Anglo-Saxon, Latin, and Greek based words, (d) focused on morpheme patterns, and (e) provided systematic strategies for reading and spelling long, unfamiliar words. Teachers taught 25 lessons in 30–45 minute blocks during a 6–8 week period. They followed the opening-middle-closing design from the READ lesson format. Students had daily opportunities to read, spell, and discuss numerous words fitting specific patterns.

The intervention design contrasted three conditions: (a) READPLUS (Project READ plus explicit decoding instruction, $n = 164$), (b) READ (Project READ with implicit decoding instruction, $n = 182$), and (c) Control (Regular basal instruction, $n = 97$).

Results

Factor analysis was employed to reduce the measure set. Several clusters that clearly converged were combined and the remaining variables stood alone. Compound words were disregarded in the final analyses because of the ceiling effect.

Table 1 shows the pre- and postscore means and standard deviations for each measurement cluster broken down by treatment group. For all but one subtest (vowel digraphs) both READ and READPLUS students made greater gains than the Controls. Two sets of planned comparisons contrasted the combined READ and READPLUS (ALLREAD) versus Control, and the READ versus READPLUS groups. Significant post test gains were made for ALLREAD over Controls in most subtests for post- and change scores.

READPLUS students made significantly greater gains than those in READ classes

Table 1

Pre-Post Means (and Standard Deviations) for WORDS Clusters by Percentage

		READPLUS	READ	Control
Consonants/Vowels	Pre	80.9 (25.3)	74.6 (29.7)	79.7 (26.0)
	Post	90.2 (13.3)	88.1 (22.5)	87.5 (22.3)
ShVows/LongVows	Pre	44.0 (34.9)	40.3 (35.7)	35.2 (30.8)
	Post	63.0 (24.2)	59.6 (30.2)	47.1 (25.6)
Blends	Pre	25.2 (34.3)	20.8 (30.3)	16.7 (29.2)
	Post	57.1 (22.6)	50.8 (27.1)	40.8 (27.9)
Consonant Digraphs	Pre	19.7 (39.4)	32.0 (39.6)	21.2 (35.5)
	Post	70.8 (27.4)	68.1 (29.8)	49.2 (35.2)
Vowel Digraphs	Pre	54.7 (43.0)	58.9 (42.6)	51.1 (43.9)
	Post	80.7 (21.3)	80.5 (24.1)	73.6 (31.3)
Roots	Pre	26.2 (35.6)	17.3 (25.1)	29.0 (28.4)
	Post	65.0 (30.1)	55.1 (30.9)	51.5 (35.2)
Prefix/Suffix/Syllables	Pre	47.7 (26.2)	44.9 (28.1)	44.6 (23.1)
	Post	72.5 (15.7)	64.7 (15.1)	62.2 (22.0)
Reading/Spelling	Pre	68.1 (13.6)	64.7 (15.1)	61.6 (15.3)
	Post	77.0 (13.1)	71.4 (16.0)	67.8 (16.8)
Total Test	Pre	47.1 (18.9)	44.2 (19.9)	42.4 (17.3)
	Post	72.0 (12.5)	67.8 (16.4)	60.0 (17.0)

for posttest performance in roots, prefix/suffix/syllable, and total test. The emphasis placed on decoding and spelling long, unfamiliar words may account for the significant posttest ($p = .001$) and change scores ($p = .045$) of READPLUS over READ performance on the reading/spelling cluster.

Typical reading tasks such as word list and paragraph reading were not administered to Control and READ students. However, four students in each of the READPLUS classes were given the Reading Subtest of the Wide Range Achievement Test (Jastak & Jastak, 1978) and spelling dictation from the New Stanford Spelling Dictation Test (Kelly, Ruch, & Terman, 1929). Students made significant pre-to-post gains (p values ranged from $\leq .025$ to $\leq .0005$ depending on grade and ability factors) suggesting that the decoding instruction had positively influenced performance.

These individuals were also interviewed to evaluate their attitudes toward the instruction. In almost all cases students said that they enjoyed the lessons, discussion, and practice. Lonny enthusiastically reported, "These (lessons) were neat! They taught me how to break down humungous words!" Another student said, "I liked them! I loved to talk more intelligent for my Dad. He got real surprised. I raised my hand 'cuz I thought I could do it." Matt remarked that "we studied the layers of language 'cuz English took lots of Latin and Greek words."

Discussion

Receiving supplementary decoding instruction provided increased knowledge of word structure and improved reading and spelling performance. Somewhat surprisingly, READPLUS students did not outperform the READ students to any marked extent in word structure knowledge. It is possible that READ teachers coached their students on the same structures emphasized in the READPLUS program and tapped in the assessment; they knew about these structures. Also, the brevity of the lessons may account for less than optimal gains in the READPLUS program.

READPLUS students did make significantly greater improvement in the morpheme and reading/spelling categories. It is clear that for complete mastery of each unit, students require a longer period of instruction.

EFFECTS FOR LEARNING DISABLED STUDENTS

As part of the first study, a group of students identified as "learning disabled" took the word-structure test and received the decoding/spelling instruction. These students, 24 boys and girls in Grades 2–5, were identified as learning disabled primarily due to deficits in reading and spelling. All were within the normal range of intelligence.

Results

Figure 1 depicts the pre- and posttest subtest proportion scores for this group of students. Like their classmates, the learning disabled students knew relatively little about complex letter-sound correspondences, and knew still less about syllable and morpheme patterns at pretest. Teachers believe that letter-sound correspondences must

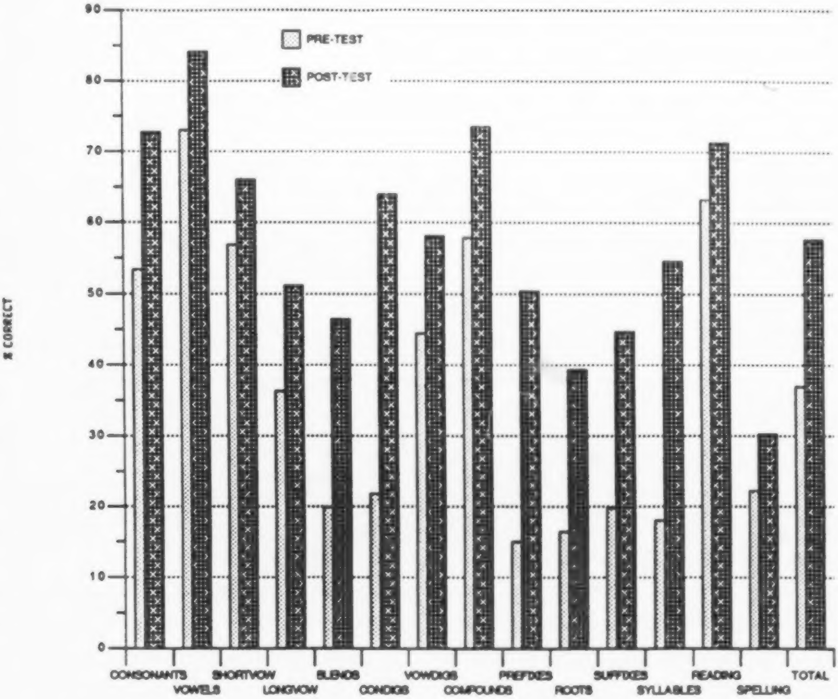

Figure 1. Pre- and posttest performance on "WORDS" by learning disabled students ($n = 24$).

be mastered before syllable and morpheme patterns can be introduced. As a consequence, learning disabled students are often limited to letter-sound correspondences as a strategy for analyzing unfamiliar words. When these students were taught structural patterns and strategies, however, they made marked gains in both word structure knowledge and reading and spelling achievement. They also made significant gains in reading and spelling on individually administered tests.

The learning disabled students also exhibited qualitatively different results following instruction. They began using technical decoding terminology with confidence and accuracy. Although they made smaller gains than their regular peers, they were challenged by the lessons and used alternative strategies to decoding and to spell longer, new words. Meg said that to read an unfamiliar long word, "You find the prefixes and suffixes—or if it's a compound. Then go to syllables and then to letters."

Discussion

Learning disabled students evidenced effects that were both quantitatively and qualitatively different than their regular peers. These students knew relatively less about word structure, especially the morpheme and syllable patterns. Reading and spelling achievement was considerably lower than their schoolmates'. Their efforts to read long words displayed more reversals, transpositions, substitutions and other errors. More importantly, non-responses were frequent, suggesting that they lacked strategies to "attack" unknown words.

After strategic instruction, students began to use technical terminology more confidently as they discussed the content of their lessons. Additional exposure to the terms and the concepts they represent might provide even greater understanding of each term. Five weeks of lessons appeared too little. Nonetheless, they clearly enjoyed the intellectual challenge of the lessons. Michael summed up the feelings of several students when he said, "We kept discussing all these words. We had lots more every day. We had to read and spell and think of lots of words."

EFFECTS FOR SPANISH BILINGUAL STUDENTS

This study investigated the applicability of the historical-structural decoding-spelling instruction in Spanish. Unlike existing transfer-based bilingual programs that focus on contrastive analyses of surface features, the present approach emphasized metacognitive understanding of the deep structure of spelling-sound relations between Spanish and English.

Much like traditional English decoding instruction, Spanish decoding instruction emphasizes regularities in letter-sound correspondences, and exceptions are learned by rote. The relations between the two languages are quite close. Teachers also discuss the syllable level as well. Spanish speakers and readers often experience difficulty transfering these skills to English. Students taught to decode only at the syllable level have little metacognitive basis for transfer between Spanish and English.

Sample

Fifteen 2nd, 3rd, and 4th grade students participated in this pilot study. Eleven were in the treatment group and 4 in the control group. All were still in the Spanish language phase of the bilingual program but had met the district criteria for beginning English instruction. Following a pretest comprised of real word decoding, synthetic word spelling, and a meta-level interview, students went through a Spanish adaptation of the historical/structural curriculum (Avelar-LaSalle, Calfee, & Moran, 1988).

Lessons averaged 20–30 minutes a day, 4–5 days a week, for approximately 6–8 weeks. Visuals reinforced the relationship between new and prior knowledge. Teachers emphasized thoughtful discussion and analysis of language. All instruction was in Spanish. The relation to English was at best implicit.

Results

The treatment had slight effect on Spanish decoding and spelling. No significant improvement resulted in Spanish decoding, although Spanish spelling performance improved significantly ($t = 4.20$, $p < .05$). Results from a metacognitive interview indicated that students tended to revise their previous strategy of syllabication in favor of identifying morphemes.

The most interesting results were on English decoding and spelling. Decoding scores increased from a mean of 3 on the pretest to a mean of 12 on the posttest (a ceiling effect on the posttest made the statistical comparisons untrustworthy, but also irrelevant). Spelling performance increased significantly ($t=22.66$, $p<.05$). Results of the metacognitive interview indicated that English pre-test subjects employed a letter-sound correspondence strategy, if they used any at all. After the treatment, students tended to identify morphemes as the primary strategy for spelling and decoding unfamiliar English words.

A visible difference in student self-confidence between pretest and posttest sittings was also apparent. Students demonstrated discomfort and anxiety on the English pretest; they appeared noticeably more relaxed and confident on the posttest.

Discussion

The expectation that students receiving the explicit instruction would perform better on Spanish decoding was only partially confirmed. Although students' ability to decode real words remained unchanged, their dictation performance improved, but only in handling accents. This feature receives little instruction until the upper elementary grades, long after students have completed the transition to English.

The more interesting effects are for the transfer to English. Students who received strategic instruction in the Spanish spelling system, with no formal English decoding or spelling instruction, performed better on English decoding and spelling tasks than comparable students who had received standard Spanish instruction. Results of the meta-level interview demonstrated an increase in awareness, usage and ability to articulate various strategies for decoding and spelling unfamiliar words. Students relied less on syllabication and more on morphemes. The result was substantial cross-lingual transfer of literacy.

SUMMARY AND IMPLICATIONS

Decoding and spelling are taught today as low-level basic skills. Basal readers handle decoding, often absorbing a substantial amount of the time for "reading" in first and second grades. By third grade, students who have managed to "figure out the system" move on to "reading to learn"; those who cannot "read aloud" with fluency are moved to special education where they typically receive the same instruction that has served them poorly in the past. Spelling is taught separately and is viewed by both students and teachers as one of the more boring facets of the elementary curriculum. The approach is rote practice into the high school years.

This state of affairs is problematic in several ways. A large number of students exhibit serious failure and become designated as learning-reading disabled because they cannot read aloud with fluency. Less obvious is the large number who manage to move through the system without a clear understanding of English letter-sound correspondences, whose capacity to decode and spell novel words is limited. The bilingual situation, especially for Hispanic students, is particularly troublesome. These youngsters speak a language that closely parallels English. After one or more years studying

Spanish spelling-sound correspondences their transition to English moves them back to the primer level. For students from other language backgrounds the basis for transfer is less obvious, but again little effort is exerted to assist transition from one spelling system to another.

Present debate about the proper place of decoding-spelling instruction remains extremist. On the one hand are advocates who hold that systematic phonics is the key to improving literacy instruction. On the other hand are those who stress the importance of "reading for meaning," who emphasize the wholeness of language and the value of grounding the early stages of the acquisition of literacy in the richness of good literature, often leaving students to their own devices to figure out the structure of English spelling.

The research and development described in this article offers a reconciliation of these two extremes. The English spelling-sound system is an amazing adaptation of print technology to a diverse spoken language that has continuously evolved over the past thousand years—and that is likely to see further change during the foreseeable future. This system *possesses meaning*. The task of curriculum and instruction is to provide students during the elementary years with an understanding of the system, one that fosters the development of skill and knowledge, independence and confidence. The three studies described in this article demonstrate that this goal is achievable, and that it has beneficial effects for students across a wide range of ability and language backgrounds.

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NAMING SPEED AND PHONOLOGICAL AWARENESS: INDEPENDENT CONTRIBUTORS TO READING DISABILITIES

Patricia Bowers
University of Waterloo

Reading is a complex skill, requiring the quick coordination of many visual and verbal subprocesses. Attempts to understand what has "gone wrong" for those children who experience an unexpected failure to progress in learning to read have focussed recently on the weakness many of these children show in phonological processing (Wagner & Torgesen, 1987). One aspect of such processing, phonological awareness, has been extensively investigated. This concept has been indexed by various measures: phoneme segmentation (e.g., Ellis & Large, 1987), phoneme deletion (e.g., Stanovich, Cunningham, & Feeman, 1984), and categorizing words by their sounds (Bradley & Bryant, 1985). Each measure discriminates reading disabled and normal reading groups. Little is known about the intercorrelations of these measures. While we know lack of phonological awareness may be a route to reading failure, it is important not to overlook other cognitive processes that may also contribute to this disability.

LaBerge and Samuels (1974) argued that content relevant to each successive stage of reading acquisition, from letter and syllable sounds to words and phrases, must be accessed not only accurately, but also relatively automatically, to allow processing resources to be used for other aspects of reading. For example, without relatively automatic word recognition, reading comprehension suffers (Perfetti, 1985). Ability to automatize is thought to be reflected in a child's speed of naming very familiar items. Denckla and Rudel (1976) and Spring and Capps (1974) demonstrated that dyslexic children were significantly slower than normal readers in simple naming tasks, such as the naming of continuous lists of highly familiar numbers, letters, pictures of objects and color patches. Wolf, Bally, and Morris (1986) showed that prereaders' speed of naming could predict their reading skill at the end of Grades 1 and 2.

Many others have noted the poorer short term verbal memory of disabled readers. Whether short term memory deficits are due to slow item identification (Dempster, 1981; Spring & Capps, 1974; Spring & Perry, 1983) or impoverished or inefficient phonetic coding in working memory (Shankweiler, Liberman, Mark, Fowler, & Fischer, 1979; Perfetti, 1985) or to verbal intelligence differences (Bowers, Steffy, & Tate, 1988) is unclear.

Few researchers have studied phonological awareness (detection of sounds in words), naming speed, and short term memory in the same sample. Ellis and Large (1987) found good and poor readers of similar IQ differed from each other on measures of these constructs. Mann (1984) found tests assessing memory, naming, and phonological awareness in kindergarten predicted first-grade reading skill well, and the predictors were relatively independent of one another. Significant correlations between naming speed and short term auditory memory have been reported (Spring & Capps, 1974; Spring & Perry, 1983; Torgesen & Houck, 1980), although strength of the relationship appears variable (Bowers, Steffy, & Tate, 1988). Wagner and Torgesen (1987) conclude from a review of the brief literature comparing phonological awareness, naming speed, and memory that, although there is some generality, each class of variables also contributes independent variance to reading. The distinctiveness of a word's sounds or its phonological codes affects memory (e.g., see Siegel & Linder, 1984), but whether this effect is related to phonological awareness is unknown.

Researchers have paid increasing attention to the reading measure used in studies. Although measures of accuracy and speed of single word identification, phonics skill, and reading comprehension are certainly correlated, they do tap different skills as well. Some variability in results of studies may be due to variability in reading measures. Reading comprehension tests, for example, are more complex than other measures, depending on analysis of meaning and memory (Curtis & Glaser, 1983) as well as word identification fluency (Perfetti, 1985). As indicated by Wagner and Torgesen (1987), we need to learn whether the several aspects of reading are related differentially to these issues.

This study, part of a larger study of the development of automaticity of naming and accuracy of phonological awareness in poor and average readers, focuses on phonological awareness, naming speed, and rote memory correlates of different reading skills.

METHOD

Teachers in three fourth grade classes in a large elementary school were asked to nominate children who had at least moderately severe problems in reading compared to age-expected performance and children who read approximately at an age-expected level. No children were identified as having severe emotional problems or not speaking fluent English. Twenty-eight students took part in the study, with the subset of average readers having a distribution of sex, classroom, and previous group IQ scores similar to the poor readers.

Tests assessed different aspects of reading as well as each proposed correlate of specific reading disability (phonological awareness, naming speed, and short term memory). The Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981) provided an estimate of verbal IQ to control for that variable in subsequent analyses. Children were seen individually for 30- to 45-minute sessions on two occasions early in the fall.

Reading comprehension was assessed by The Canadian Test of Basic Skills (King, 1976), a group achievement test which had been administered a few months prior to the study (at the end of Grade 3).

Accuracy of single word reading and of nonsense word decoding were assessed by two subtests of the Woodcock Reading Mastery Test (Woodcock, 1973), Word Identification and Word Attack, administered to each child individually.

Naming Speed was assessed by digit and letter continuous naming tasks similar to those devised by Denckla and Rudel (1976). Children were asked to say the names of 48 single syllable digits as quickly as they could without making mistakes. Six digits repeated eight times in semirandom order were printed in six rows of eight items. Children also named 48 capital letters as quickly as they could. A similar arrangement of six letters repeated eight times was presented to them. Two trials of each test were given; the score was the mean items per second across two trials.

Three phonological awareness tests were administered: (a) The Auditory Analysis Test (AAT) (Rosner & Simon, 1971) is a sound deletion test which discriminates between good and poor readers across a relatively large age range. It was adapted and shortened for this sample. Items include deletions of first or later consonants of a consonant blend, or the end consonant. For example, the examiner says, "Say block." The child repeats "block." The examiner continues, "Now say it without the /b/." The score is the total correct out of 24 items. (b) The Odd Word Out task of Bradley and Bryant (1978) is a sound categorization task which has discriminated dyslexic and good readers in several studies (Bryant & Bradley, 1985). The examiner says four words (e.g., sun, see, sock, rag) at the rate of one per second. The child tells which word does not belong with the other three based on its sound. Three of the words may begin with the same sound, have the same medial sound, or end with the same sound. (c) The third phonological task was adopted from Snowling (1981). Children were asked to repeat three and four syllable real and nonsense words pronounced by the examiner. The nonsense words were analogous to real words in the list. For example, the child was asked to say both "magnificent " and "bagmivishent"; each accurate repetition earned a point. Words and nonwords were presented in mixed order. Snowling (1981) reports accuracy of nonword repetition discriminated reading groups. In the current sample, there is a strong ceiling effect on the total score. The score for the most difficult part, four-syllable nonwords, suffers that effect a bit less strongly, and it is those scores which are analyzed here.

Short term memory was assessed by the Digit Span subtest from the WISC-R (Wechsler, 1974). The raw score from the Digits Forward portion of the test was used, since deficits in this skill have characterized disabled readers in other studies.

RESULTS

Data for one poor reader was dropped from analyses because the PPVT-R score was below 85. Table 1 describes characteristics of the children. Reading scores of the groups are significantly different. Although many of the poor readers would not be called dyslexic by a strict criterion (i.e., 1½ to 2 years discrepancy between age-expected and actual reading skill) most were reading a year or more below their age expected level. The groups also differ on PPVT-R estimates of general verbal ability, and therefore these scores are statistically controlled in all subsequent analyses.

Intercorrelations of the measures (Table 2) reveal that the phonological tasks are

Table 1

Means (and Standard Deviations) for Reader Groups on All Variables

	Poor Readers[a]	Average Readers[b]	*t*	*p*
IQ Estimates				
PPVT-R	100.2 (2.9)	107.3 (6.6)	2.72	<.05
Reading				
Word Identification	28% (17%)	54% (18%)	3.75	<.001
Word Attack	27% (19%)	49% (23%)	2.69	<.05
CTBS Grade[c]	2.5 (.5)	4.0 (.5)	7.83	<.001
Naming Speed items/sec.				
Digit Naming Speed	1.85 (.26)	2.14 (.36)	2.41	<.05
Letter Naming Speed	1.77 (.22)	1.97 (.43)	1.48	n.s.
Phonological Tasks				
Auditory Analysis Test	9.14 (6.44)	16.15 (5.83)	2.96	<.01
Odd Word Out	22.43 (2.79)	25.46 (3.62)	2.45	<.05
Snowling: Total/32	29.64 (2.13)	30.08 (1.38)	.62	n.s.
Snowling: 4 syllable nonword/8	6.43 (1.45)	6.77 (.83)	.74	n.s.
Memory				
Digit Span Forward	4.57 (1.60)	6.23 (2.65)	1.99	<.1

[a]*N* = 14. [b]*N* = 13. [c]Test administered at end of Grade 3.

Table 2

Intercorrelation of Measure

	PPVT	WID	WATK	CTBS	AAT	Snowling	Odd Word	DNS	LNS	Digit Span
PPVT	X	.53**	.46**	.35**	.38*	.28	.27	.06	.13	.04
WID		X	.92***	.62***	.70***	.53**	.48**	.51**	.38*	.47**
WATK			X	.45**	.66***	.54***	.36*	.43*	.32	.46**
CTBS				X	.46**	.10	.53**	.61***	.47**	.50**
AAT					X	.10	.18	.24	.07	.18
Snowling						X	.20	.13	.17	.23
Odd Word							X	.40*	.44*	.45**
DNS								X	.85***	.79***
LNS									X	.68***
Digit Span										X

*p<.05. **p<.01. ***p<.001.

not significantly related to one another in this sample, but all are related to aspects of reading. Digit and letter naming speed are highly intercorrelated, with digit naming speed (DNS) having the higher relationship to reading. Digits, the symbols named most often in daily life by all readers, may best tap ability to achieve automaticity of naming more generally. If DNS is statistically controlled, letter naming speed contributes no additional variance to reading, so DNS is used in subsequent analyses. DNS, Digit Span, and Odd Word Out are intercorrelated, but are unrelated to the other phonological awareness scores.

Hierarchical regression analyses were conducted to tease out independent sources of variation which contribute to the three types of reading scores. PPVT-R standard scores were entered at the first step (Table 3). When entered at Step 2, DNS accounted for significant new variance in the three reading tests. The phonological tests each contributed variance to reading individual words and nonwords when entered at Step 2, and Digit Span also contributed at this step. To determine if the phonological tests contributed significant variance independent of naming speed, separate analyses were run, with each of these tasks entered at Step 3, after DNS. The Odd Word Out task was no longer significantly related to any reading subtest when entered after PPVT-R and DNS, but the sound deletion (AAT) and the nonword repetition (Snowling) tests continued to predict substantial variance in word and nonword reading scores (Table 4). Clearly, the AAT and Snowling Repetition test tap important variance independent of naming automaticity.

Table 3

Regression Analyses Predicting Reading

		Word Identification		Word Attack		CTBS	
Variables	Step	R	R^2_{cha}	R	R^2_{cha}	R	R^2_{cha}
PPVT	1	.53	.28**	.46	.21*	.35	.12
DNS	2	.71	.23**	.61	.16*	.68	.34***
AAT	2	.75	.29***	.70	.28**	.49	.12
Snowling	2	.66	.16*	.63	.19*	.35	.00
Odd Word	2	.63	.12*	.52	.06	.57	.21*
Digit Span	2	.69	.20**	.63	.19*	.60	.23**

$*p<.05$. $**p<.01$. $***p<.001$.

Table 4

Regression Analyses Controlling DNS

		Word Identification		Word Attack		CTBS	
Variables	Step	R	R^2_{cha}	R	R^2_{cha}	R	R^2_{cha}
PPVT	1	.53	.28**	.46	.21*	.35	.12
DNS	2	.71	.23***	.61	.16*	.68	.34***
AAT	3	.84	.19***	.76	.20**	.72	.05
Snowling	3	.79	.12**	.72	.15*	.69	.00
Odd Word	3	.73	.03	.62	.01	.73	.06
Digit Span	3	.72	.01	.64	.04	.68	.00

$*p<.05$. $**p<.01$. $***p<.001$.

Whether naming speed also contributes variance independently of phonological tasks was investigated by reversing order of entry, that is, by entering the phonological tasks at Steps 2 and 3, and DNS at Step 4. It may be seen in Table 5 that DNS continues to predict all three reading tasks significantly; it is an especially strong predictor of CTBS score. The relative independence of the phonological tests from one another and from DNS while all are related to some aspects of reading leads to high multiple Rs for reading subtests.

The role played by short-term rote memory in reading difficulties was explored by entering Digits Forward score into the regression analyses (Table 6). Again, when entered after PPVT-R, Digit Span contributed significant variance to all reading scores. In this instance DNS did not contribute variance to word and nonword reading additional to that of Digit Span, but DNS did contribute additional variance to CTBS scores. Both AAT and Snowling Nonword Repetition contributed significantly to Word Identification and Word Attack after controlling for Digit Span, but the Odd Word Out procedure did not continue to predict any reading test. When order of entry was reversed and Digit Span entered at Step 3 after naming speed (Table 4), Digit Span failed to predict significant further variance in reading.

Table 5

Regression Analyses with Reversed Order of Entry

		Word Identification		Word Attack		CTBS	
Variables	Step	R	R^2_{cha}	R	R^2_{cha}	R	R^2_{cha}
PPVT-R	1	.53	.28**	.46	.21*	.35	.12
Snowling	2	.66	.16*	.63	.19*	.35	.00
AAT	3	.85	.29***	.82	.28***	.49	.12
DNS	4	.91	.10**	.86	.06*	.72	.27**

*p<.05. **p<.01. ***p<.001.

Table 6

Regression Analyses Controlling Memory

		Word Identification		Word Attack		CTBS	
Variables	Step	R	R^2_{cha}	R	R^2_{cha}	R	R^2_{cha}
PPVT-R	1	.53	.28**	.46	.21*	.35	.12
Digit Span	2	.69	.20**	.63	.19*	.60	.23**
DNS	3	.72	.04	.64	.01	.68	.11*
AAT	3	.83	.21***	.78	.21**	.65	.07
Snowling	3	.76	.09*	.72	.12*	.61	.01
Odd Word	3	.71	.03	.64	.00	.65	.07

*p<.05. **p<.01. ***p<.001.

DISCUSSION

The most important finding of this study is that the Auditory Analysis Test, Snowling's Nonword Repetition test, and Digit Naming Speed are each independent contributors to several types of reading tasks. Despite performances close to the test's ceiling, nonword repetition was strongly related to Word Identification and Word Attack scores. Few Grade 4 students are not proficient in the task of synthesizing unfamiliar speech and converting the pattern into a new speech-motor program. Those who are not, however, are usually quite disadvantaged in learning to identify new words and in decoding unfamiliar words. Quite another deficit is that revealed by the AAT. This is indeed a harder task for Grade 4 students, with even good readers making mistakes on it. The difficult job is that of analyzing the ongoing speech stream, isolating the phoneme indicated, and then synthesizing the rest of the stream. It is easy to imagine how students who have difficulty on this auditory task might also have difficulty on the visual task most resembling it, Word Attack, where sounds of visual symbols must be both analyzed and synthesized.

Both phonological tasks are related only to individual word and nonword reading, and not to the broader CTBS reading measure which no doubt combines word identification with heavy demands for fluency, discourse analysis, and memory. Naming speed, on the other hand, is related to all three reading measures. The automaticity of naming visual symbols contributes variance to decoding above and beyond auditory analysis and synthesis skills, and automaticity plays a strong role in reading comprehension.

This study used a chronological age rather than a reading age control group, so that the experimental design does not rule out the possibility that differences on phonological and automaticity variables are an "effect" as much as a "cause" of the difference in reading progress. However, both variables have been found to distinguish prereaders who later differ in reading status, suggesting that the results cannot be fully attributed to effects of reading experience.

The strong relationship between memory span and naming speed confirms some findings in the literature (Spring & Perry, 1983), but is stronger than the modest correlation found in a previous study (Bowers, Steffy, & Tate, 1988). Future work must determine parameters (e.g., age, type of IQ control) regulating size of this relationship. Whatever its size, the arguments of Dempster (1981) are compelling. He feels that an important determinant of memory span and its relationship to learning disabilities is speed of item identification. The interrelationships of Bradley and Bryant's Odd Word Out task, Naming Speed and Digit Span suggest that a task with a rote memory component will have at least some overlapping variance with item identification speed and will correlate with various reading tasks, especially comprehension. At the same time, the relative lack of relationship between phonological tasks and memory and naming speed variables suggests there are distinct processing requirements for single word identification tasks. The ability to analyze and to synthesize phonological information affected individual word and nonword reading independently. Differences among predictors of reading may be more fruitful to emphasize than the idea that name or sound codes are used in all.

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VOCABULARY INSTRUCTION AND READING COMPREHENSION WITH BILINGUAL LEARNING DISABLED STUDENTS[1]

Candace S. Bos, Adela Artola Allen, and David J. Scanlon
University of Arizona

The increasing evidence of a positive relationship between rich vocabulary instruction and reading comprehension (Mezynski, 1983; Stahl & Fairbanks, 1986) and the role limited vocabulary knowledge plays in the reading performance of bilingual learning disabled (LD) children (Cummins, 1984; Zavala & Mims, 1983) invites scholars to study the effectiveness of vocabulary instructional practices on the reading comprehension of these students. Although much effort with this population has focused on identification issues (Ortiz & Maldonado-Colon, 1986), there is a paucity of instructional research.

This study investigated use of three interactive strategies on vocabulary acquisition, reading comprehension, and quality of written recalls of bilingual students who have identified reading disabilities. The strategies are based on the construct that learning is a sociocultural event where students' language and culture become the setting within which meaning is negotiated (Green & Weade, 1987; Vygotsky, 1978; Wells, 1979). Within this context, teachers organize instruction to activate students' background knowledge (Rumelhart, 1980; Tikunoff, 1985) and to encourage them to select, predict, justify, and confirm their understanding (Goodman, 1984). Specifically, it was hypothesized that three interactive vocabulary strategies—semantic mapping (SM) (Pearson & Johnson, 1978; Smith, 1975), semantic feature analysis (SFA) (Anders & Bos, 1986; Johnson & Pearson, 1984), and semantic/syntactic feature analysis (SSFA) (Allen, 1985)—would facilitate vocabulary acquisition, reading comprehension, and quality of written recalls to a greater degree than definition instruction (DI) which focuses on learning definitions using high student engagement through oral recitation, careful teacher monitoring, and corrective feedback (Duffy & Roehler, 1982).

METHOD

Subjects

Subjects were 42 bilingual, upper elementary learning disabled students. Learning disabilities were identified according to school district criteria including a discrepancy

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between intellectual ability (Performance IQ, $M=96.93$, $SD=9.36$) and reading achievement (Woodcock-Johnson, $M=75.98$, $SD=7.53$). No significant differences were evident among the four instructional groups for Performance IQ, $F=1.24$, (3, 38), or reading achievement, $F=.15$, (3, 37). To be considered Spanish/English bilingual, Spanish needed to be the student's first language and some degree of Spanish needed to be spoken in the home. The students' current teachers categorized the language(s) of instruction for each student with 54% identified as benefiting from instruction in Spanish or Spanish with support in English, and 38% benefiting from instruction in English or English with support in Spanish. Eight percent were categorized "about" equally proficient in both languages.

Students were grouped according to language of instruction and were assigned to one of four instructional conditions. Instructional groups consisted of 3 to 6 students.

Materials

The instructional and assessment materials were developed in both Spanish and English.

Instructional materials. Two chapters from a third-grade social studies text (Hirsch & Bacon, 1988) were used for instruction. A native speaker of Spanish translated the chapters and instructional and assessment materials into Spanish taking into consideration regional conventions. Each chapter was analyzed using a content analysis (Frayer, Frederick, & Klausmeier, 1969) to identify key concepts and their relationships. While one chapter served as the practice reading passage, a chapter of approximately 1,000 words and an estimated readability of fourth grade (Fry, 1977) served as the experimental passage. The chapter focused on mountain regions using a descriptive expository text structure.

The concepts (content-related vocabulary) generated from the content analysis and concise context-grounded definitions served as the focus of instruction in the four intervention conditions. In the DI condition, instructional materials consisted of a written list of vocabulary and their definitions. In the SM condition, a written list of vocabulary was used to generate a semantic map (Pearson & Johnson, 1978). In the SFA condition, a hierarchically structured matrix (relationship chart) was constructed for instruction (Anders & Bos, 1986). In the SSFA condition, the SFA chart was provided along with cloze-type sentences generated from vocabulary and relationships depicted on the chart (Allen 1985). General teaching scripts were developed for each instructional condition.

Assessment materials. To measure vocabulary acquisition and reading comprehension, a 30-item multiple-choice test for the experimental passage and a similar test for the practice passage were developed. Test construction was based on the content analysis of each passage. Each test consisted of 15 vocabulary and 15 comprehension items. The vocabulary items measured knowledge of context-related meanings of the vocabulary; the comprehension items measured understanding of ideas presented in the passage and ability to apply the concepts in novel situations. Prior knowledge for the experimental passage was measured using the 30 items from the experimental passage test and 10 items from the practice passage test. Interest in the subject matter was measured using a 7-item inventory on which interest in learning about the topic was rated on a 5-point Likert scale. Each item represented a key concept from the content analysis.

Procedures

Four researchers served as teachers. They were bilingual (English/Spanish), familiar with the Spanish dialect common to the community, and qualified to instruct in Spanish, English, or a combination of both. Each was trained in the different instructional interventions and randomly assigned to at least two different instructional conditions. Prior to intervention students were given the prior knowledge test and topic interest inventory. Two to 3 weeks later, students participated in three 50-minute practice sessions. Approximately 2 weeks later, they participated in three 50-minute experimental sessions.

During the first practice and experimental session, students participated in a prereading activity designed to enhance reading comprehension. In the DI condition, instruction consisted of engaging the students in correct and automatic pronunciation of each vocabulary word and phrase and the memorization of concise context-related definitions. The techniques used during instruction were oral recitation, positive and corrective feedback, and systematic review and practice of vocabulary and definitions. For the three interactive conditions, students were invited to predict definitions for vocabulary and offer background knowledge and experiences related to their community and culture. In the SM condition, the interactive discussion focused on predicting meanings and constructing a map. For the SFA condition, discussion focused on completing the chart by predicting vocabulary meanings and their relationships to one another. In the SSFA condition, students not only completed the relationship chart, but also completed five cloze-type sentences using information derived from the chart.

On the second day of intervention, the researcher and students in all conditions reviewed their respective instructional materials and read to confirm their predictions and learning using their prereading materials as a guide. Following reading, students discussed the instructional materials and clarified questions. On the third day of intervention, students again reviewed their instructional materials and were instructed to write "all you know about the topic." Following writing, students completed the multiple-choice test. To measure long term learning, the written recall and objective test were completed 4 weeks later.

Throughout the instructional process, the researchers used students' preferred language of instruction using the other language as support when needed. Students read the passage and took the multiple-choice test in the language in which their reading was more proficient. No instructions were given specifying in which language to write the recall.

Data Scoring and Analysis

For the objective test, each item was computer scored as correct or incorrect and a vocabulary score and comprehension score were computed for each student. For the written recall, each recall was parsed by conceptual units, adapted from Frederiksen's (1975) propositional analysis. The conceptual units were then classified as text-specific (i.e., found in the text or the instructional materials), student relevant (i.e., relevant to the topic but generated by the student), student irrelevant, or student inaccurate.

Interscorer reliability for the conceptual units was .85. Each recall was also scored using traditional holistic scoring procedures (Irwin & Mitchell, 1983) with a 6-point rating. The criteria of spelling, handwriting, and punctuation were disregarded in this analysis.

Data were analyzed to determine short- and long-term learning effects of the four instructional conditions on the bilingual LD students' learning using a 4 × 2 (mixed) design. The four instructional conditions served as the between factor, while time (posttest and follow-up test) served as the within factor. The scores for experimental items on the prior knowledge test, the topic interest inventory, and Performance Scale IQ served as covariates. These three factors were selected due to their theoretical link to the dependent measures (Anderson, Reynolds, Schallert, & Goetz, 1977; Osako & Anders, 1983; Torgesen, 1987). Performance rather than Full Scale IQ was selected as the better measure of intellectual functioning for these bilingual students (Clarizio, 1982).

RESULTS

The relationship the covariates played in each separate analysis varied across the reading test and the written recalls. Although prior knowledge served as a significant covariate for both the vocabulary score, $F = 27.37$, (1, 35) $p < .001$, and the comprehension score, $F = 19.02$, (1, 35) $p < .001$, on the reading test, prior knowledge was not a significant covariate in the written recall measures. Prior interest in the topic and Performance IQ were not significant covariates in any of the analyses.

Results from the reading test were analyzed for both the vocabulary and comprehension scores. The adjusted means and standard deviations at posttest and follow-up are presented in Table 1. In terms of the vocabulary score, results of the main effect tests indicate a significant effect for condition, $F = 4.19$, (1, 35) $p = < .01$, but not for time or the interaction. Post hoc analyses for condition using the Newman-Keuls method (Glass & Hopkins, 1984; Kirk, 1968) indicate students in the SSFA condition scored significantly higher ($p < .05$) than students in the DI condition. No other comparisons were significant. Results for the comprehension items were similar with a main effect for condition ($F = 3.94$, (1, 35) $p = < .02$). Post hoc analyses indicate students in the SM and SFA conditions scored significantly higher ($p < .05$) than students in the DI condition. The difference between SSFA and DI conditions, while not statistically significant ($p < .07$), may be educationally significant. Analyses for the conceptual units and holistic scores on written recalls indicate differences were not evident among the four instructional conditions. However, students' written recalls across conditions were consistently better at posttest than at follow-up for both the conceptual units, $F = 8.59$, (1, 38) $p = < .005$, and the holistic rating, $F = 9.65$, (1, 38) $p = < .004$. No interactions were significant.

DISCUSSION

Results of the reading comprehension measure support use of a sociocultural model which focuses on interaction of teachers and students and emphasizes the re-

Table 1

Adjusted Means and Standard Deviations for the Reading Test and Written Recall (n=42)

Scores	Definition Instruction ($n = 12$)	Semantic Mapping ($n = 10$)	Semantic Feature Analysis ($n = 9$)	Semantic/Syntactic Feature Analysis ($n = 11$)
Vocabulary				
Posttest	6.41	6.59	8.09	7.76
	(2.2)	(2.5)	(2.6)	(1.9)
Follow-up	5.74	7.89	7.65	8.67
	(2.2)	(2.4)	(1.6)	(2.6)
Comprehension				
Posttest	6.19	8.50	8.55	7.88
	(2.7)	(2.6)	(1.9)	(2.2)
Follow-up	6.03	8.30	8.33	8.24
	(1.9)	(2.6)	(2.4)	(2.3)
Conceptual Units				
Posttest	8.61	9.53	10.31	7.87
	(5.2)	(6.4)	(4.4)	(9.6)
Follow-up	5.95	5.13	7.64	1.78
	(5.3)	(8.7)	(3.5)	(3.6)
Holistic Rating				
Posttest	4.05	4.22	4.98	5.14
	(2.0)	(2.3)	(1.6)	(1.6)
Follow-up	3.72	3.44	3.10	2.34
	(1.4)	(2.3)	(1.1)	(1.6)

lationship of language and culture to subject matter content. The interactive vocabulary strategies investigated took place as sociocultural events in which the researcher used students' culture and linguistic competence as a basis for mediating meaning. Students' background knowledge of mountain regions (the topic of the experimental passage) provided the starting point from which text comprehension was built. This finding is particularly important because it addresses a population which has not been studied previously—bilingual students who are experiencing difficulties in literacy development. It implies that vocabulary instruction findings related to heterogeneous and learning disabled populations (Stahl & Fairbanks, 1986) are applicable to this population when language of instruction is taken into account.

A caveat to be considered is that differences in vocabulary acquisition were not evident except between students in the SSFA and DI conditions. This is not surprising because the DI condition placed major emphasis on rote learning of the same vocabulary that composed the vocabulary measure. Other research with learning disabled students (Pany, Jenkins, & Schreck, 1982) has found that this type of direct vocabulary instruction is beneficial for learning vocabulary, but not for reading comprehension.

Although greater reading comprehension was evident for the interactive conditions on the reading test, when the task required students to spontaneously generate and write about the topic, students in the interactive conditions were not able to produce qualitatively or quantitatively superior recalls. This might be predicted given other research indicating that upper elementary students with learning disabilities have particular difficulty spontaneously generating vocabulary information (Simmons & Kameenui, 1988) and have limited opportunities for and knowledge of content specific writing (Englert, Raphael, Fear, & Anderson, 1988; Moll, in press).

If the social interactive strategies used here are to serve for reading comprehension improvement, they must afford bilingual LD students the opportunity of becoming empowered in their own learning. Further research needs to look at teachers, as capable others, becoming users of the strategies and then transferring these strategies to students. Moreover, repeated exposures to the interactive vocabulary strategies could further improve reading comprehension, and the explicit linking of reading to writing could facilitate the quality of written recalls.

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DEFINING IS AN UNNATURAL ACT: A STUDY OF WRITTEN DEFINITIONS

Camille L. Z. Blachowicz and Peter J. L. Fisher
National College of Education

How students become effective dictionary users is a question that most teachers address in the elementary and high school curriculum. That dictionary definitions are often confusing to students, inadequate to the task, and not the avenue of first choice for word learning have all been amply documented (Miller & Gildea, 1987; Nagy, 1988). Yet literate adults are able to use a dictionary and definitions as tools to develop, refine, or express word meanings (Iris, Litowitz, & Evens, 1988; Parker, 1984).

Schwartz and Raphael (1985) have suggested that students develop a "concept of definition," a schemata for word meaning, which can be used in helping students analyze and consolidate what they know about a particular word. To this end, they have experimented with a definition frame reflecting some of the classic Aristotelian definitional categories, and with the instructional tasks in filling such a frame as a tool for vocabulary growth. Such an approach may also be promising for the development of dictionary use strategies. The purpose of the study reported here was to analyze children's written definitions to determine if definitions or aspects of definitions were schematized by students in the middle elementary grades.

Most of the earlier research on children's definitions which might reveal what sorts of definitional concepts or schemata children have, has been carried out for the purpose of investigating how concepts develop (Binet & Simon, 1916; Feifel & Lorge, 1950; Terman, 1916). These studies have suggested that verbal definitions move from the functional to the abstract as children mature. This movement has been interpreted, particularly by Piagetians, as a function of children reaching stages of more logical cognitive behavior, and as indicating that students reach a point at which logical definitions, the Aristotelian model, should be the norm (Al-Issa, 1969; Swartz & Hall, 1972).

There is evidence, however, to challenge this "stage theory" of defining ability. Though most researchers would suggest that there is, indeed, an increase in the abstraction of definitions of school age children, there do not appear to be sudden discontinuous stages of defining behavior (Keil & Batterman, 1984). Rather, it has been suggested that the types of definitions offered or judged as adequate by definers of all ages are subject to variation. Hurlburt (1954) found that nouns lent themselves much more easily to defining tasks. Also, Russell and Saadeh (1962) determined that students who were well able to give abstract definitions preferred to select functional definitions for some words and abstract words for others, when offered alternatives. For example, for the word "experience" an abstract definition was normally preferred; for "farmer" a functional definition would be selected, thus emphasizing that the semantic value of different words require different defining strategies. A third constraint is that the type of definition one can offer depends on one's knowledge of the word being defined (Wolman & Barker, 1965) and of the terms in which it can be defined (Cocks, 1978).

It appears questionable, then, that a single frame, or expectation for filling that frame, could serve in all defining situations. To aid in the formulation of a more generic frame or alternative frames, we began to investigate the ways in which fourth graders defined words they knew well, looking for categorical regularities. We wondered, in other words, if students gave evidence of having regular schemata for definitions and if, and how, these schemata varied.

METHOD

Subjects

Subjects were 89 fourth-grade students from several Midwestern suburban school districts, and 15 inservice and preservice teachers enrolled in courses at a nearby college. Fourth-grade students were chosen because (a) researchers in many previous studies had worked with this age level, (b) it was the level at which abstract thinking has been posited to be established, (c) it is a grade level at which the vocabulary load of school material increases dramatically, and (d) it is a level at which dictionary instruction is an important component of most curricula. All of the fourth-grade students read at least at a fourth-grade level on district class materials. The teachers were chosen to provide "mature" definitions for contrastive purposes (see below).

Materials

The list of words or phrases to be defined was comprised of four each of nouns, verbs, adjectives, and adverbs. The words used were: short, beautiful, loudly, queen, to cook, suddenly, red, to jump, chair, to talk, slowly, house, gently, rat, to throw, glad. Each word had a familiarity rating of over 90% for fourth graders (Dale & O'Rourke, 1981), had a synonym or categorical superordinate of at least 75% familiarity, and was judged as familiar and appropriate by a panel of teachers.

Procedure

Data were collected from the students in four sessions for each of six intact class groups. The students in each class were presented by their teachers with the printed, randomized list of words, four at each session. They were directed to write a definition for each word, explaining the meaning for someone who did not know the word. Adults wrote their definitions in either one or four separate sessions.

Scoring

Reponses were classified using a modification of the system developed by Feifel and Lorge (1950). The seven classification categories were: category, synonym/antonym, explanation, descriptional or functional explanation, instance, use in a sentence, and repetition or association. Examples of the classification are:

1. Category: chair = a piece of furniture
   glad = in a happy manner
2. Synonym/Antonym: beautiful = very pretty
   short = not very tall
3. Explanation: short = a very little time or distance
   slowly = to take things soft, quiet
4. Description or Function: house = four walls and a roof
   chair = something to sit on
5. Instance: suddenly = as I turned a corner a car turned and almost hit me
6. Sentence: slowly = She was walking very slowly.
7. Repetition or Association: suddenly = all of a sudden
   short = short and stout

Definitions could be classified in more than one category (e.g., synonym and use in a sentence) if more than one type of information was provided. The two experimenters coded all the definitions and reached an interrater agreement of 91% for a random sample of responses.

RESULTS AND DISCUSSION

A simple frequency analysis summed across all definitions comparing adults and children suggests results that are consistent with the findings of earlier studies (see Figure 1). Although explanation was the most common type of definition given by both groups, adults wrote more definitions that were classified as containing a categorical element than did the younger subjects. The latter produced a slightly larger number of functional and descriptive explanations, instances, and sentences containing the target words, paralleling the results of earlier studies. However, when results were reorganized by parts of speech, significantly different profiles resulted. For the sake of economy, and because school-age children were the primary concern of the study, the following analyses will concentrate primarily on children's definitions. On the whole, the adult results paralleled those of the fourth graders except where specifically indicated.

The classifications so organized (see Figures 2–5) show that there was a certain amount of regularity within each part of speech but that some categories were nonexistent, or virtually so, for certain parts of speech. For example, descriptional and functional definitions were not given for adverbs, and rarely given for adjectives, whereas categorical definitions rarely appeared for verbs. Synonyms and antonyms were commonly provided for adjectives and adverbs, whereas categories were most common for nouns. These results confirm that it is not productive to attempt to conceptualize a

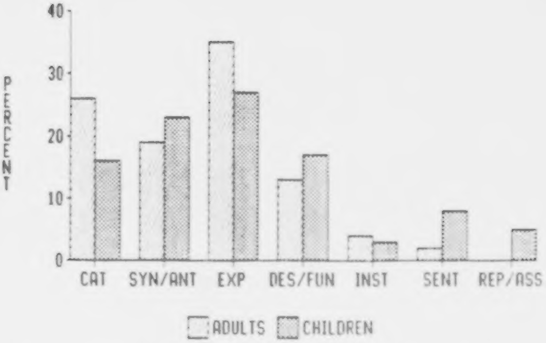

Figure 1. Percentage of adults' and children's definitions in each category for all words.

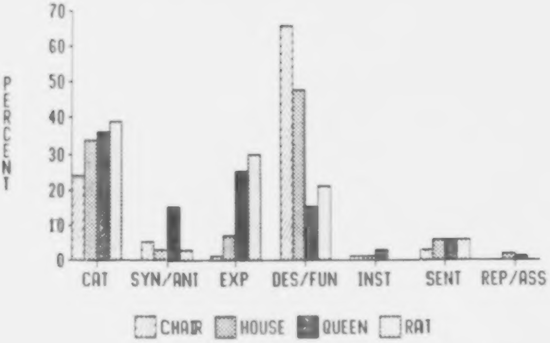

Figure 2. Percentage of children's noun definitions in each category.

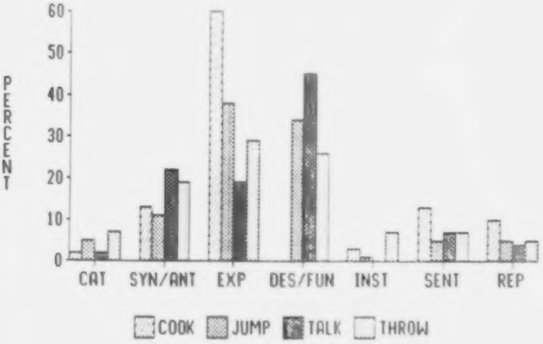

Figure 3. Percentage of children's verb definitions in each category.

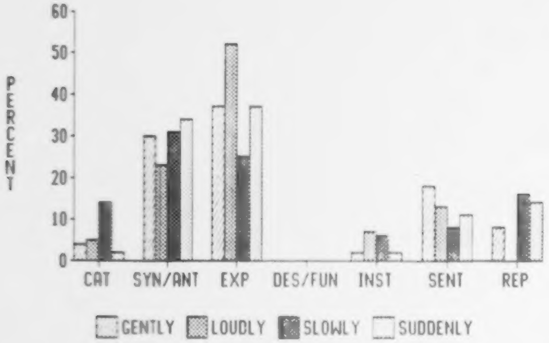

Figure 4. Percentage of children's adverb definitions in each category.

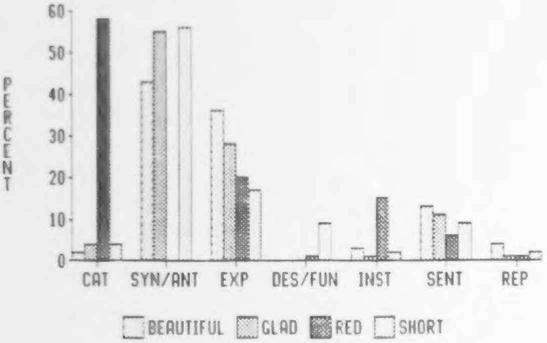

Figure 5. Percentage of children's adjective definitions in each category.

single definitions frame for all parts of speech but rather to assume multiple definitional schemata.

Complicating the matter further was the variation that existed within each part of speech that indicated other important influences at the word level. Among nouns, for example, "chair" obviously lends itself more to a functional definition than does "rat." With verbs, "to cook" did not receive a descriptive or functional definition whereas this response was quite common for "to talk." Thus, words in the same part of speech category may have quite different profiles, whereas words which were different parts of speech may have similar ones (e.g., "beautiful" and "suddenly.")

Certainly, then, part of speech and saliency of a certain defining characteristic for a particular word, such as the "rat-chair" example above, are word-determinate variables that affect the type of definition that will be produced. However, there also appear to be definer-determinate variables operating as well. Most significant were those relating to accessibility of defining terms to the definer, a variable perhaps related to student background. This was apparent in a situation such as the defining of "red" where several adults produced synonyms such as "crimson" or "scarlet"—two words with low familiarity ratings for fourth graders who did not produce these, or any other synonyms, for "red." This knowledge relatedness was also apparent in examinations of responses when the same categories were produced. For example, the definitions for the word "queen" had a large number of categories indicated by both adults and fourth graders; however, the category most common for adults was that of "royalty," whereas for the younger subjects "queen" fell more frequently into the category of "wife," such as the definition, "Queen, the wife of a ruler, sorta like Nancy Ray Gun."

It is interesting to note that younger subjects often "marked" categories for which a specific term was inaccessible to them by using a placeholder, for example, in words or phrases such as, "someone," "a thing," "the way you do something." They also attached syntactic markers (such as "not fastly" for "slowly") or part of speech designations (such as "n" or "v") to their definitions. All these variations and attempts suggest that, although the definer's current knowledge is a significant variable in the defining process, students do have categorical expectations for certain types of definitions even when the information to fill these categories is not immediately accessible.

Besides part of speech, semantic saliency, and accessibility variables, defining styles were apparent. Certain subjects, both adult and fourth graders, had preferred modes of responding—some favoring definitions relying on single, frequent synonyms, whereas others always appending an instance, and so forth. Instruction appears to enter into these stylistic considerations, as was noted in the case of definitions with example sentences. Though it appears on the overall analysis (see Figure 1) that fourth-grade students had significantly more of this type of response, one class of students accounted for 80% of this type, suggesting a strong instructional influence.

Another stylistic tendency that was demonstrated across both groups of subjects was the tendency to "string" definitions. That is, for most of the words, most subjects supplied several different types of categorical responses. Further, the experimenters found it very difficult to develop clear-cut classification categories for definitions for several of the target words. High interrater reliability was ultimately achieved by making some rather arbitrary decisions. Although this is not particularly illuminating within the framework of the current analysis, it raises a question about previous analyses which have been cited as evidence for hierarchical developmental patterns. In these reports, the examples supplied were unambiguous, implying that the definitions produced were discrete and thus, could be hierarchically classified; that is, orange was defined only as "fruit" which would be superior to the definition "something you eat." In this study, it was common for several of the defining categories to co-occur, and we presume, such results also occurred in other research. Without clarity on how these types of results had been handled in earlier research, we are even more skeptical about their interpretation as evidence for both a hierarchical developmental pattern in definitions and the assumed superiority of definitions with the "higher level" characteristics.

These results, and the problems encountered in the research, suggest a few conclusions, and even more questions, that are relevant to those interested in using this and previous research on children's definitions to inform instruction. The first is that it is not reasonable to expect a single schema to underpin a generalized defining strategy. What is more likely is that certain profiles of definitional categories will apply to differing parts of speech with significant variation within these profiles.

Besides word determinate variables, both the definer's knowledge about the concepts and categories related to the word to be defined, and access to terms with which to define it, are critical. However, the presence of the "marking" response suggests that students can begin to develop an anticipation for a schematic placeholder even when exact defining terms are not available. Also, knowing that even mature definers tend to string definitions suggest that hierarchical criteria for evaluating definitions are not appropriate. Rather, there should be a great enough latitude in judging what is acceptable to allow for variations in knowledge and style among definers.

This stringing characteristic also suggests an interesting direction for further research on children's definitions. It is clear that the categories used in this and prior research provide only rough approximations of what constitutes the information contained in a definition. A reevaluation of this data looking at co-occurences of categories may reveal regular profiles based on types of information which tend to appear together. For example, when a synonym is given, what other type of information tends to be presented to provide more specifying information? This type of investigation could provide probabilistic schemata for different words and word types. A second type of analysis that may be productive is one based on categories of information type similar to those used for analyzing contextual information (Sternberg, Powell, & Kaye, 1983). For example, does a definition provide information about placement in space, value, extension, existence, and so forth? These linguistic information categories may prove more productive than those emphasizing hierarchical classification.

A third type of investigation that is relevant to the information reported here would be to undertake a comparison of children's definitions with those provided in reference materials intended for their use. Such comparisons would be useful in several respects. They would suggest ways to modify existing references so that definitions can be recast to match the expectations of young reference users. Alternatively, children's own definitions could be used as an initial framework to help them reorganize the information these references contain so they are in line with their own schemata or to modify their own schemata when appropriate. In either case, such comparisons would provide starting points for constructing dynamic instruction that builds upon what children already know.

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VOCABULARY KNOWLEDGE AND GEOMETRIC ANALOGY REASONING: NATURE AND DEGREE OF RELATIONSHIP

C. Stephen White
University of Georgia

This investigation examined the relationship between vocabulary knowledge and analogical reasoning in young children aged 4 through 6. Early reading programs have traditionally given vocabulary knowledge extensive attention since an understanding of words seems necessary for the successful language manipulation that is required in learning to read and write (Nagy, 1988). Vocabulary knowledge refers to a verbal ability that is dependent upon receptive understanding and verbal expression of one's own native language. Young children's vocabulary knowledge has been strongly correlated with general language competence (Gleason & Pease, 1985) and highly predictive of school success (Owens, 1984). Many school achievement and aptitude measures include some assessment of vocabulary knowledge (Dunn & Dunn, 1981; Owens, 1984).

There is a wealth of research which has documented the strength of the relationship between vocabulary knowledge and reading comprehension (Nagy, 1988). One cannot understand written and spoken language without knowing what most words mean. Vocabulary knowledge has also been considered indicative of world knowledge; that is, the words one understands and uses are representative of schematically held knowledge (Freebody & Anderson, 1983). For young children, vocabulary knowledge is often attained through the activation of prior knowledge when learning new concepts and ideas. The acquisition of vocabulary knowledge may be based on some form of associative learning where a relation is made between the verbal symbol, the word, and the concept that word represents (Mourk, 1977). This associative learning appears to bear some resemblance to the reasoning and thinking processes underlying analogical reasoning.

Analogical reasoning is an important cognitive process that can be considered essential to human learning. In teaching and learning contexts, analogies are instructional tools used by teachers and learners to make novel or complex information comprehensible by relating it to information that is more familiar and simpler (Davidson, 1976). For younger or inexperienced learners to understand and process information that is given to them, they must interpret the ideas and relate them to their own knowledge and experience. There is an extensive body of literature which relates analogy to reading comprehension (e.g., Hayes & Tierney, 1980; Vosniadou & Ortony, 1983) and analogy has long been associated with effective instruction (Gagne, 1985).

The pervasiveness of reasoning by analogy has been recognized by research which has focused on the nature (Mulholland, Pellegrino, & Glaser, 1980; Sternberg, 1977), development (Holyoak, Junn, & Billman, 1984; Sternberg & Rifkin, 1979), and training (Alexander, White, & Mangano, 1983; Alexander, Wilson, et al., 1987; Sternberg, Ketron, & Powell, 1982) of analogical reasoning abilities. Recent research has demonstrated that preschool children can and do solve analogy problems (Alexander, Willson, White, & Fuqua, 1987; Brown, Kane, & Echols, 1986; Crisafi & Brown, 1986) and that young children who do not do so spontaneously can be trained to reason analogically (Alexander, Wilson, et al., 1987; White & Alexander, 1986; White & Caropreso, 1988). These researchers have shown that when provided with an appropriate and motivating task, young children were successful at solving analogy problems (Alexander, Willson, et al., 1989; Brown, Kane, Echols, 1986; Vosnaidou & Schommer, 1986). For example, Vosnaidou and Schommer (1986) found that the use of explanatory analogies can help 5-year-olds comprehend expository text.

The research which has examined young children's performance on analogy problems has been most concerned with the question of whether young children *do* or *do not* reason analogically. These studies have focused primarily on cognitive capabilities rather than on the factors which contribute to analogical reasoning in the young. Although it has been shown that analogy can enhance comprehension and that there is a strong relationship between vocabulary knowledge and successful comprehension with older learners, the relationship between young children's vocabulary knowledge and the ability to solve analogy problems has not been explored. In addition, subjects in prior investigations have frequently been from white, middle-class backgrounds and judged to be of average to above average ability, based on traditional achievement and intelligence tests.

The purpose of this investigation was to examine the extent of the relationship between analogical reasoning and vocabulary knowledge with young children from varying socioeconomic and cultural backgrounds. This investigation was part of a larger study which examined the relationship between analogical reasoning and other variables such as socioeconomic status (SES), ethnicity, and gender. In a search of the literature, no studies were identified that had undertaken an investigation of the relationship between vocabulary knowledge and the analogical reasoning capabilities of young children.

METHOD

Subjects

Subjects participating in this study were 108 four-, five-, and six-year-olds. These subjects were from seven sites in northcentral, central, and northwest Texas, northeast Georgia, and northwest Virginia. The breakdown of the sample in terms of age, gender, ethnicity, and SES level are as follows: 44 four-year-olds, 32 five-year-olds, and 32 six-year-olds; 54 males and 54 females; 70 white children, 21 Hispanics, 17 Blacks; and 61 low SES and 47 middle/high SES.

Materials

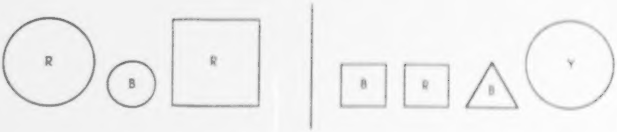
In this investigation two assessment instruments were employed. For the determination of vocabulary knowledge the *Peabody Picture Vocabulary Test* or PPVT (Dunn & Dunn, 1981), Forms L and M, was given. The PPVT is a standardized instrument that is widely applied in schools and clinical settings to assess vocabulary acquisition. Although not intended to serve as a comprehensive measure of general intelligence, the PPVT correlates well with tests such as the Stanford-Binet and Weschsler Intelligence Scale for Children Revised. (See the manual for data on the reliability and validity of the PPVT.) The test was designed for use with subjects between 2.5 and 40 years of age, ". . . who can see and hear reasonably well, and understand Standard English to some degree" (Dunn & Dunn, 1981, p. x).

Specifically, the PPVT consists of 180 items ordered by level of vocabulary difficulty; 5 of these serve as practice items. Each item is composed of four simple black and white illustrations, presented in a 2 × 2 matrix. Subjects demonstrated their understanding of a vocabulary term by selecting one of the four illustrations that best represented the word spoken by the examiner. Each child was tested individually during a session which lasted from 10 to 20 minutes. For the purposes of this investigation, only standard scores ($M = 100$, $SD = 15$) were used to establish the categories for receptive vocabulary knowledge. Children receiving a standard score of 129 or above were categorized as very high in vocabulary knowledge. The remaining categories and their corresponding standard scores were high (115 to 128), average (100 to 114), low (85 to 100) and very low (84 or below).

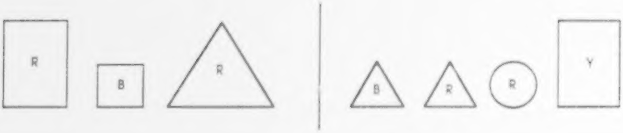
As a measure of analogical reasoning performance, the Test of Analogical Reasoning in Children or the TARC was used (Alexander, Willson, et al., 1987). The TARC is a test of analogy problem solving presented in a game-playing format. The TARC is composed of 16 geometric analogy problems assembled in an A:B::C:? array with four options from which the final D term is to be selected. The four options are displayed vertically to the right of the item stem. The first two items of the TARC serve as practice items and are not included in analysis. Two forms of the TARC, the game version, Form A, and the reduced paper version, Form E, were used in this study (see Willson, et al., 1986, for a discussion of the reliability and the validity of the TARC versions and forms). Each form used is presented in Figure 1.

The game and reduced paper versions differ in that the game version is a manipulative task. The stem of the analogy problem is constructed of attribute blocks varying on the dimensions of size (large, small), shape (square, rectangle, circle, triangle), and color (red, blue, yellow). The options are four attribute blocks that are laid out vertically to the right of the gameboard. The child solves a given analogy problem by selecting, picking up and placing the desired option block on the gameboard. The size and format of the reduced paper version more closely approximates the types of problems appearing on tests of aptitude or achievement (e.g., Kaufman-Assessment Battery for Children, Raven's Coloured Progressive Matrices). The paper version represents each TARC item on a 4 × 6 card. The child marks his or her selected solution option with either a grease pencil or a game piece. In this investigation subjects were balanced for TARC format.

TARC administration began by telling the children that they were going to be



Item 4, Form A



Item 4, Form E

Figure 1. Sample items from the TARC. (From "The development of analogical reasoning in four- and five-year old children" by P. A. Alexander, V. L. Willson, C. S. White, J. D. Fugua, G. D. Clark, A. F. Wilson, and J. M. Kulikowich, 1989, *Cognitive Development, 4*, p. 70. Copyright 1989 by Ablex Publishing Corporation. Reprinted by permission.)

playing a game, and that in this game they must find the option piece that goes with the C term in the same way that the A and B terms go together. The rules of the game were repeated with each new item and credit was given for the selection of the option that correctly solved the analogy problem. All children were individually tested and each testing session lasted 20–25 minutes.

Procedures

Information on the age, ethnicity, and socioeconomic status of each subject was secured prior to test administration from written documentation available at each of the testing sites. Parental permission was also obtained for all children participating in the investigation. The site of testing was the child's day care, preschool, or school facility. In all cases, efforts were made to familiarize the child with the environment before testing. The testing was randomly ordered between PPVT and TARC for each child. Typically, the children met with the examiner on two sessions conducted over 2 days, with one of the instruments administered at each session.

RESULTS AND DISCUSSION

The purpose of this study was to investigate the relationship between vocabulary knowledge and geometric analogy reasoning among 4-, 5-, and 6-year-old children. TARC scores were based on a maximum of 14 out of 16 (items one and two counted as practice items). Effects for vocabulary knowledge on TARC performance were analyzed by using a general linear model. The TARC means and standard deviations by vocabulary knowledge category for the 108 children tested are displayed in Table 1.

Table 1

Means and Standard Deviations for TARC Performance by Vocabulary Knowledge

Vocabulary Knowledge	*n*	TARC Performance *M*	*SD*
Very high (129 and above)	12	10.25	3.65
High (115 to 128)	19	8.32	4.53
Average (100 to 114)	20	6.15	4.72
Low (85 to 99)	35	5.29	3.62
Very low	22	3.41	2.65

Note. Means reflect group performance on a 14-item test.

Vocabulary knowledge was determined to have a significant effect on children's analogical reasoning performance, $F(4, 103) = 9.58$, $p < .0001$, $MS_e = 15.22$. Following the determination of main effect for vocabulary knowledge, additional pairwise analyses were conducted. Results of the Bonferroni (Dunn) t tests indicated that those children with very high vocabulary knowledge were significantly different in analogy performance from students who were average and low in vocabulary knowledge. In addition, students who were high in vocabulary knowledge performed significantly differently on the TARC than did students who were low in vocabulary knowledge. As seen in Table 2, the strength of the relationship between the PPVT and TARC was attested to by a regression analysis of all other predictors. Of all the variables entered into the regression model, PPVT was the best predictor of TARC performance, accounting for approximately 22% ($F = 16.97$, $df = 1, 102$) of the total variance. Once PPVT variance was removed, no other variable contributed significantly to the total regression equation.

The strong association between vocabulary knowledge and geometric analogy reasoning might be explained by certain similarities in the two tasks. Both the PPVT and TARC are tests of cognitive ability; therefore, performance on both may well be reflective of general intellectual ability or of cognitive development of the children tested. On both tasks children are required to follow the questioning routines, follow directions, and respond to the tester's queries, and so forth. In addition, the PPVT requires the child to infer a relationship between the spoken word and a pictoral representation of that word. According to componential analysis of analogy tasks

Table 2

Summary of Simultaneous Regression Analysis for TARC Performance

Category	R^2	Beta	*F*-ratios	*p*
Age	.01	.03	.64	.43
Vocabulary Knowledge	.22	.08	16.97	.00
Gender	.01	.61	.63	.44
SES	.07	.05	.00	.96
Ethnicity	.04	−.43	.68	.41

(Sternberg, 1977), inferring is a primary component in the successful performance of analogy problems such as those on the TARC.

Although these findings help to further clarify the relationship between vocabulary knowledge and analogical reasoning performance in young children, additional questions remain. The strong relationship between verbal ability and geometric analogy performance should be further delineated and specified. Performance on other measures of verbal ability such as intelligence and achievement tests needs to be compared to analogical reasoning ability. The relationship between analogical reasoning and other language-based activities which are not measured by traditional achievement tests such as story telling and story listening comprehension also need to be examined.

Additional investigations should also address questions related to how vocabulary knowledge and analogical reasoning can be instructionally linked in early reading and language programs. For example, what are effective ways to incorporate analogical reasoning processes into language activities which seek to establish associations between words and written symbols or between words and concepts? This linkage may be accomplished by pursuing instructional practices suggested by research in emergent literacy (e.g., Mason & Allen, 1986) and vocabulary instruction (e.g., Nagy, 1988).

If we view early reading and language learning as an active, constructive, and problem solving process then an approach which fosters active processing of language may provide a linkage to analogical reasoning. For example, Mason (1985) suggests that old familiar information such as letters, words, and stories should be related by the child to new information and interpreted in terms of existing structures. When new information does not fit, teachers should initiate a search for a more appropriate structure. Teachers can accomplish this by leading children in an analysis of stories and writing before reading to them. During a discussion of a story children can express the important story ideas, interpret the characters' actions, and make predictions about what might happen. By analyzing story motives and outcomes, teachers can assist children in putting together their own underlying structure of the information (Mason, 1985). When teachers verbalize strategies which require making comparisons, identifying attributes and relationships, and expressing abstractions, children may become more proficient at recognizing, understanding, and remembering presented information. This suggested procedure for analyzing stories and facilitating comprehension incorporates several of the underlying problem-solving processes which comprise analogical reasoning.

We also need to examine the inclusion of analogical reasoning in early language instruction for the purpose of finding ways to meet the needs of children who enter school situations with a variety of literary experiences. Prior research which has demonstrated that low SES preschool children can be trained to solve analogy problems (White & Caropreso, 1988), has not addressed the incorporation of a higher level thinking skill such as analogical reasoning into early language experiences. The combination of analogical reasoning with early language experiences designed for young learners from different ethnic, SES, and cultural groups may help us find ways to deliver instruction which makes learning more lasting and meaningful to these children. Further exploration of early reading and language experiences which include distinctive problem-solving processes such as those found in analogical reasoning may provide additional ways to help young children understand, organize, and process the new and unfamiliar information that is encountered in early reading and language programs.

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TASK VARIATIONS AND PRIOR KNOWLEDGE IN LEARNING WORD MEANINGS FROM CONTEXT

Steven A. Stahl
Western Illinois University

Children learn most of their productive meaning vocabulary from exposure to words in context. Nagy and Anderson (1984) estimated that, on the average, children acquire a vocabulary of roughly 45,000 word families (words and derivatives) over the school years. If we estimate that the average child learns about 6,000 of these prior to entering school, this breaks down to about 3,000 families that need to be learned every year. In fact, studies do indicate that this is approximately the number of new word meanings children acquire during the school years (Graves & Slater, 1987).

There are two other facts about the 3,000-word figure. First, there are significant variations in the number of words children acquire. Graves and Slater (1987) estimate this can vary between 1,000 and 5,000 words, a significant variation. Therefore, there are tremendous differences in the numbers of words known by students with good and poor vocabularies. These differences are bound to make a significant difference in their reading (Stanovich, 1986). Second, although direct instruction of vocabulary seems to significantly improve comprehension (Stahl & Fairbanks, 1986), it is impossible to directly teach as many words as average readers acquire on their own. Estimates are that one can profitably teach 200–300 and possibly as high as 800 words per year (Nagy & Anderson, 1984).

Studies of children's ability to learn from context have found that students can acquire the requisite number of words from context, given the number of words they read per year, the number of previously unknown words encountered, and the rate of incidental learning of those words from context. Nagy, Herman, and Anderson (1985) found students can learn 15–20% of unknown words in a text well enough to answer multiple-choice questions given 15 minutes after reading. Nagy, Anderson, and Herman (1987) found the rate of incidental learning from context dropped to about 5% when the test was given 6 days after reading the text. This latter figure is a better estimate of the long-term effects of reading unknown words in context. It is not unreasonable to assume that an average fifth grader reads about 1,200,000 words per year (Anderson, Wilson, & Fielding, 1988), of which roughly 60,000 are unfamiliar (5% of the 1,200,000), a 5% learning rate would account for the 3,000 words per year that Graves and Slater (1987) estimate they actually do learn.

Conditions that Affect Learning from Context

The tetrahedral model described by Brown, Campione, and Day (1981) suggests that successful learning involves interaction of learner factors, text factors, task factors, and how learning was assessed. Sternberg (1987) similarly suggests learning from context involves interplay of three factors—the learner's processes of knowledge acquisition, contextual cues available in text, and moderating variables, such as number of difficult words and number of repetitions of the unknown word.

Learner factors. Of the learner factors, a number of studies have examined effects of student ability on learning from context. When the task was *deriving* meanings of unknown words, or when students were asked directly to infer meanings of unknown words, clear ability differences were found (e.g., Elshout-Mohr & van Daalen-Kapteijns, 1987; McKeown, 1985). When the task was learning word meanings incidentally, or when students read for a different purpose but were given a surprise vocabulary test, differences were not always found. Jenkins, Stein, and Wysocki (1984) and Herman, Anderson, Pearson, and Nagy (1987) found significant ability differences, whereas Nagy et al. (1985; 1987) did not.

Aside from general ability, Sternberg (1987) also suggests specific comprehension might affect word learning. He argues that vocabulary learning is a result of learning from text, rather than a cause. He suggests comprehension involves getting a rough idea of meanings of unknown words. Thus, the more able one is to comprehend text, the more words one will learn from context, regardless of one's general ability.

Text factors. Nagy et al. (1987) found percentage of conceptually difficult words, defined as words which could not be defined outside of a related system of concepts, significantly affected learning from context, as did average length of target words in syllables and a rating of amount of contextual support given. Length of a target word (again, in syllables) did not affect probability of learning that word, however. Nagy et al. tested other factors which also did not appear to affect learning from context. Among these were part of speech and morphological transparency. Text genre and readability affected learning from context in complex interactions with other factors.

Task factors. Only one task factor has been examined in the learning from context literature, to my knowledge. Konopak et al. (1987) found children learned more when directed to derive word meanings than in an incidental learning condition where they were not given specific directions.

Our research (Stahl, Jacobson, Davis, & Davis 1989) suggests vocabulary difficulty affects readers' microprocessing, or the understanding of individual sentences and the relations between them. If so, having children do a comprehension task which relies on microprocessing would force them to direct attention toward unknown words and might affect learning from context more than a task requiring more general processing. In our other studies, children given difficult vocabulary versions recalled significantly fewer propositions in the order they occurred in text and were significantly less able to recognize order of significant events in the narrative. They also were significantly poorer at exact replacement of function words in a cloze activity. In this study, the microprocessing task was a conventional cloze task, one which Kintsch and Yarbrough (1982) found to be sensitive to microprocessing.

In addition to examining effects of different orienting tasks, this study was designed to examine effects of several learner factors—general comprehension ability and specific comprehension of the target passage, and prior knowledge of the subject of the passage.

METHOD

Subjects

Subjects were 182 sixth graders who participated in two of a series of studies (Stahl et al., 1989, Exp. 2 and 3). They attended eight classes located in two central Illinois communities. Eighty-three subjects lived in a rural, farming community; the remainder lived in a community adjacent to a small city. They were of diverse socioeconomic status and all were Caucasian. All were given a fifth-grade passage from the *De Santi Cloze Reading Inventory* (De Santi, 1986). This measure was used because we wished to account for general ability to deal with cloze activities and because it presented acceptable concurrent validity with a standardized achievement test. There were no significant differences found between any of the groups on this measure.

Materials

The studies all used the same passage, a 500-word fictional narrative description of activities of a native tribe living in the Amazonian basin, the Yanomamos. Subjects were given the original passage, as taken from a social studies textbook (Owen, 1972), or a difficult version created by substituting a difficult synonym for every sixth content word (Stahl & Jacobson, 1986). Difficult synonyms were defined as words rated at or above eighth-grade level in the Dale and O'Rourke (1976) compendium. Students in the cloze condition were given one version of the passage in a conventional cloze format, with the first and last sentences intact and every fifth word replaced by a standard size blank, except if the fifth word was a substituted word. Then the blank was placed either before or after the difficult word, alternating before and after. Students in the normal reading version were given an intact version of the passage.

The dependent variable was a multiple-choice test assessing knowledge of 10 substituted words. Three were taken from the beginning of the passage, four from the middle, and three from the end. Words were chosen randomly, with the provision that they could be defined succinctly by a synonym. Therefore, all words were of intermediate conceptual complexity, using the criteria of Nagy et al. (1987). On the test, there were four choices for each target word: a synonym, a word of the same part of speech and from the same semantic field, and two other words of the same part of speech.

Procedures

Before reading, students were told key facts about the Yanomamos (that they were extremely violent and distrustful of people not in their immediate village) or facts which were tangential to the narrative (that the Yanomamo were polygamous). An analysis of the passage indicates information about the violence and distrust underlies the central information, whereas information about polygamy relates only to a single low level detail. Lessons were given to classes by an experienced social studies teacher. My observation was that students appeared highly interested and engaged during the lessons. In the normal reading condition, 92 of the 99 subjects rated themselves as either "Interested" or "Very Interested" in the presentation.

Following the presentation, students read the passage. In the cloze condition, they were instructed to fill in the cloze blanks with a word that made sense in the passage. In the normal reading condition, they were told they would be asked about the passage. In both conditions, the passage was taken away after reading and subjects were immediately given the multiple-choice test. This was given first to avoid reaction with the other comprehension activities given after reading (see Stahl et al., 1989).

Analysis

At least 15 students were in each of eight possible conditions, defined by a 2 (Vocabulary Difficulty) × 2 (Relevant, Irrevalent Preteaching) × 2 (Cloze, Normal Reading Condition) design matrix. Learning from context effects were tested through interactions of Vocabulary Difficulty with the other factors. Thus, learning from context was measured by comparing those students who saw the difficult vocabulary with those who read a passage not containing the tested words. An Analysis of Covariance, with the De Santi cloze score as the covariate, tested effects of these factors. Effects of students' general ability and specific comprehension of the passage on learning from context were tested in secondary analyses.

RESULTS

In the ANCOVA, only effects for the covariate and the main effect for vocabulary difficulty were statistically significant, $F(1, 175)=4.41$, $p<.01$. Children in the difficult vocabulary condition answered an average of seven-tenths of a question better than children in the easy vocabulary condition. This suggests that children learned about 7% of the words from one reading in context (see Table 1). Although children in the cloze condition learned slightly more words from context than those in the normal reading condition, the hypothesized interaction between Vocabulary Difficulty and Condition did not approach statistical significance.

Nor did effects due to preteaching approach statistical significance. In this study, children receiving relevant preteaching learned no more words than those receiving irrelevant preteaching. The preteaching did, however, affect children's comprehension

Table 1

Means (and Standard Deviations) by Material, Vocabulary Difficulty, and Preteaching

	Preteaching			
Vocabulary Difficulty	Relevant	Irrelevant	None	Total
Cloze Passage				
Easy	4.46 (1.66)	4.92 (1.59)	5.33 (2.01)	4.89 (1.74)
Difficult	5.82 (0.98)	5.91 (2.06)	5.76 (1.64)	5.85 (1.71)
Normal Passage				
Easy	5.67 (1.76)	6.00 (1.76)		5.84 (1.75)
Difficult	6.33 (2.12)	6.40 (1.73)		6.37 (1.91)

in the normal reading condition (see Stahl et al., 1989). It was not expected to significantly affect cloze comprehension and it did not.

General ability did significantly affect performance on the multiple-choice test, but did not significantly interact with vocabulary difficulty. Students with higher general ability knew more words, but, in this study, as in Nagy et al.'s two studies (1985, 1987), students with higher ability were not significantly better at inferring word meanings from context in an incidental learning task.

To examine Sternberg's (1987) suggestion that amount of learning from context might relate to a person's comprehension of the passage, I calculated a partial correlation between total cloze score and the multiple-choice measure in both the easy and the difficult vocabulary conditions, partialling out effects of the cloze inventory score. (The only global comprehension measure available was the cloze task, so only the 83 subjects in that condition were included.) If greater comprehension was related to greater learning from context, then the correlation between the child's cloze score and multiple-choice measure should be higher for the difficult vocabulary sample than for the easy vocabulary sample. In fact, for the easy vocabulary group, the correlation was 0.25 ($p<.07$), whereas that for the difficult vocabulary condition was 0.18 (which did not approach significance). These results are not unambiguously interpretable, since a number of factors may be included in those correlations, but they are lower than expected from Sternberg's hypothesis. Separate correlations between number of function and content words correctly replaced were equally inconclusive.

DISCUSSION

Results of this study confirm earlier studies indicating children learn word meanings from context, but did not find effects on the rate of that learning due to task manipulation, prior knowledge, general or specific comprehension. The 7% learning from context rate is lower than found in the Nagy et al. (1985) study, which most closely approximated the conditions in the present study. The differences may be due to differences in how word meanings were measured. They used a structured interview to measure word knowledge, as opposed to a fairly difficult multiple-choice test.

Especially interesting is the finding that subjects inferred word meanings from context at approximately the same rate when performing a cloze replacement task as they did during normal reading. Presumably, a cloze task involves different text processing than conventional reading for comprehension. Yet, in spite of these differences, subjects' learning from context was not impaired, nor was it enhanced.

W. E. Nagy (personal communication, March 6, 1989) points out that these results are a powerful demonstration of the ability of readers to learn from context. Twenty percent of the text was replaced with cloze blanks and an additional 7% were unknown words (roughly 40% of the text were content words and 17% of these were replaced with presumably unknown synonyms). Then, in spite of the fact that 27% of the words in the text were unknown, students still gained word meanings at a rate not dissimilar to students reading unmanipulated text. This is a powerful demonstration of how readers can take advantage of the redundancies in text to gain information about word meanings.

Lack of effects due to prior knowledge are difficult to interpret. One cannot say that prior knowledge did not make a difference in learning from context, since our preteaching may be a weak surrogate for the concept of prior knowledge. However, the preteaching used here did significantly affect overall text comprehension in the Stahl et al. (1989, exp. 1) study. It also could be that the effects of prior knowledge were slight, and undetectable because of noise inherent in a between-subject design.

Failure to find effects on learning from context due to general or specific comprehension skill is equally difficult to interpret. Three studies, Nagy et al. (1985, 1987) and the present study failed to find significant effects for general comprehension on an incidental learning task whereas two others, Jenkins et al. (1984) and Herman et al. (1987) did.

If, as found here, high ability students are no better at inferring word meanings than low ability students, then the differences in vocabulary size found by Graves and Slater (1987) may be due to differences in the amount of reading volume, rather than differences in ability per se. Anderson et al. (1988) found large differences in the amount of text high and low ability children read annually, differences large enough to affect their vocabulary acquisition and consequently their overall reading ability. This argument that the "rich get richer" was made forcefully by Stanovich (1986). This suggests that, to increase children's vocabulary size and consequently their comprehension skill, efforts should be made to motivate poorer readers to read more connected text. Some studies have found that some amount of silent reading of connected text significantly improves reading skill, whereas others did not (Wilkinson, Anderson, & Pearson, 1988).

If there are ability differences in learning from context, this suggests efforts should be made to specifically train students in strategies to do this more efficiently. At present, such training does not appear to be particularly effective. Some studies have found inconsistent effects due to context clue training (e.g., Kranzer & Pikulski, 1988; Sternberg, 1987). Where such training has been found effective (e.g., Herman & Weaver, 1988), it seems to work by making students more aware of the importance of deriving meanings of unknown words while reading and more motivated to infer their meanings (cf. Konopak, et al., 1987).

We know that children learn most words from exposure in context. We know that vocabulary knowledge correlates strongly with reading comprehension skill and that to increase a child's vocabulary knowledge is to improve comprehension, over the long term (Stahl & Fairbanks, 1986). It is important that we know more about the conditions which promote learning from context, so that we can directly improve all children's comprehension abilities.

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THE VOCABULARY OF CULTURAL LITERACY IN A NEWSPAPER OF SUBSTANCE

John Willinsky
University of Calgary

E. D. Hirsch, Jr. (1987) has captured the nation's educational imagination with his concept of cultural literacy. As he tells the story, over the course of this decade he has repeatedly been encouraged to expand on this idea of a literacy based on a shared cultural store of knowledge; his response has grown from an essay to a book to a dictionary covering "what every American needs to know." The argument is that a common cultural store of knowledge is necessary for effective communication in a democracy, and this knowledge is not being taught in the schools which are, instead, focusing on empty skills and ignoring the substance of the culture, its history, literature, arts, and sciences. In support of a renewed cultural curriculum for the schools, he and two of his colleagues have developed a 5,000-item list of "What Literate Americans Know" (Hirsch, Kett, & Trefil, 1987). The list is "intended to illustrate the character and range of the knowledge literate Americans share" (p. 146). The original list was validated by submitting it to "over one hundred consultants" who arrived at a 90% agreement on the inclusion of the terms (p. 146).

But as school jurisdictions consider whether to pursue this approach by deploying the recently developed and nationally normed *Cultural Literacy Test* (1989) or by introducing the grade-level "lists of literacy concepts" prepared by the Cultural Literacy Foundation into their programs, educators require a realistic description of precisely what role the items on the list play in the nation's literacy. This study is a small first step in that direction. It ascertains how often a sample of these items appear in a substantial publication, *The New York Times*. This study speaks to both the weak and the strong claims of Hirsch's argument: The list of cultural terms is the common language of national publications; communication and, in turn, the social fabric of this society are dependent on a familiarity with these terms. A secondary aspect of this research is to demonstrate the usefulness of an electronic database in creating a profile of culture, literacy, and language.

The choice of the *Times* is highly appropriate because the newspaper plays a crucial role in Hirsch's argument in two senses. First, in the matter of criteria, he proposes in *The Dictionary of Cultural Literacy* (Hirsch et al., 1988) that the terms are not to be too specialized (nor too general), and that they are to be found in "national publications," although they are not to be simply the product of "current events" (pp. x–xi). Second, he stresses the newspaper's importance to the nation, citing Thomas Jefferson's famous remark about choosing a newspaper over a government, if such a choice had to be made—as cultural literacy is necessary for good citizenship, "all citizens should be able, for instance, to read newspapers of substance" (1987, p. 12). Although reading is proving to be a less prominent activity and the newspaper is showing a declining readership since the Second World War (Robinson, 1980), studies are still finding that more time is spent reading the paper than other forms of print (Guthrie & Seifert, 1983; Sharon, 1973/74). It remains a major source for cultural literacy and the best place to begin testing the claims of a prescribed program.

METHOD

The commercial database service NEXIS operated by Mead Data Corporation carries *The New York Times* in electronic form dating back to June, 1980. These files consist of the entire text of the daily paper, including the book review section and the Sunday magazine, but excluding advertising and classified ads. Because of the considerable expense involved in using the database, a random sample of 424 terms (or 9%) was selected by choosing every tenth term from the original list and excluding those that were essentially "unsearchable," such as dates and nonspecific terms such as "nature-nurture controversy" (Hirsch et al., 1987, pp. 152–215). Each term or expression which was searched produced a frequency of occurrence that covered the *Times* over a period of 101 months, from June 1, 1980 to October 28, 1988, representing a substantial corpus of 660.5 million words.

To give a sense of how often a term might be expected to turn up in the *Times*, four frequency periods were devised based on how often, on average, a term might be expected to turn up in the newspaper. Those terms that had a frequency of between 0 and 100 occurences can be expected to be found on roughly a *yearly* basis; those with between 101 to 436 occurrences, can be expected to turn up on a *monthly* basis; those that occurred between 437 to 3,058 times at a *weekly* rate; and those at or better than 3,059 times might be expected to occur on a *daily* basis. For example, the term "forty winks" showed up 8 times in the search of 101 months which averages out to approximately once a year or, using these divisions, on a "yearly" basis. However, an avid reader spending an hour per day on the paper (with the national average 35–40 minutes according to Guthrie & Seifert, 1983) would cover little more than a tenth of the *Times*, given its 218,000 words/day. Which is to say, a term that appeared on a yearly basis might only occur once in a decade of devoted reading.

To add another dimension to this profile of cultural literacy in the *Times*, the terms were divided into eight categories to suggest which areas of cultural knowledge might be most profitably attended to in preparing to read a national newspaper. The categories are based on a simplified version of Hirsch, Kett, and Trefil's 23 divisions which are employed in the *Dictionary of Cultural Literacy* (1988). Using this dictionary as a guide, the terms were sorted into the categories of geography, history, idioms/proverbs, literature/arts, math/sciences, politics/economics, psychology/anthropology, and religion.

RESULTS

The frequency of occurrence for the 424 terms over the course of the 8.4 years of *The New York Times* ranged from 0 (for 13 of the terms) to a high of 236,269 for "New

York'' (with the next highest, ''New Jersey,'' at 40,409). The average number of occurrences for the sample was 1,323. The median number of occurrences was 164, suggesting that the very frequently used terms skewed the average, and that the majority of terms could be expected to turn up on a monthly basis if the entire paper were read, or less often than on a yearly basis given the average reader's habits.

At the high end of the frequency scale, the top 30 terms had ratings of over 4,800 occurrences (see Table 1). These included a set of fundamental political concepts—''democracy'' (11,707 occurrences), ''republic'' (13,357), ''parliament'' (11,306)—along with a host of economic and geographical terms, all of them linked to current events in what might be termed the geo-econo-political sphere of action. But, religion was also well represented with ''priest'' (8,153), ''temple'' (8,003), and ''the Pope'' (6,435); although it should be noted that the words can, on occasion, be used in other contexts. A more specific cultural picture can also be found in a few of the popular terms such as the ''Securites and Exchange Commission'' (7,821) ''CIA'' (7,245), and ''Madison Avenue'' (6,088), as well as ''creditor'' (5,055) and ''entrepreneur'' (4,944).

At the low end of the frequency scale, there were 30 terms which turned up no more than twice in the 8.4 years of the *Times* (see Table 2). Many of these were expressions such as ''little strokes fell big oaks'' and ''give him enough rope and he'll hang himself'' which perhaps do not meet the literary standards of the newspaper. Science terms, such as ''blackbody radiation,'' ''chordates,'' and ''homeostasis,'' also did poorly, suggesting that they may fall outside Hirsch's criteria for nonspecialized terms.

In tracing the frequency distribution by category, a number of trends become apparent (see Table 3). It should be noted that the totals by category represent the

Table 1

The 30 Most Frequently Used Sampled Cultural Literacy Terms in The New York Times

Asia
Atlantic City
cell
Central Intelligence Agency (CIA)
commodity
Court of Appeals
creditor
democracy
dividend
entrepeneur
gross national product (GNP)
Iraq
London
Madison Avenue
merger
New Jersey
New York
parliament
pension
Peru
the Pope
priest
republic
Rome
Securities and Exchange Commission (SEC)
Securities Council
Switzerland
temple
Vermont
Warsaw

Note. These 30 terms (*N* = 424) had greater than 4,800 occurrences in *The New York Times* between June 1, 1980 and October 28, 1988.

Table 2

The 30 Least Frequently Used Sampled Cultural Literacy Terms in The New York Times

ancien regime
Birds of Venus
blackbody radiation
Burr-Hamilton duel
chordates
an elephant never forgets
export quote
for want of a nail the kingdom was lost
homeostasis
I wandered lonely as a cloud
indefinite article
Indian file
Jamestown settlement
John XXIII
Joshua Fit the Battle
judicial review
land breeze
law of contradiction
little strokes fell great oaks
Nero fiddled while Rome burned
nitrogenous wastes
not with a bang but a whimper
man shall not live by bread alone
moon made of green cheese
patience of Penelope
poets are born, not made
a stitch in time saves nine
Tudor monarchy
walk under a ladder
You cannot serve God and mammon

Note. These 30 terms ($N = 424$) had no more than 2 occurrences in *The New York Times* between June 1, 1980 and October 28, 1988.

Table 3

Percentage Occurrence of Sampled Cultural Literacy Terms by Category at Four Frequency Levels

	Frequency Level				
Category	Yearly % (*f*)	Monthly % (*f*)	Weekly % (*f*)	Daily % (*f*)	Total % (*f*)
Geography	3.5 (15)	2.8 (12)	4.5 (19)	4.2 (18)	15.1 (64)
History	6.1 (26)	4.2 (18)	0.9 (4)	0.2 (1)	11.6 (49)
Idioms/Proverbs	9.4 (40)	5.4 (23)	0.7 (3)	0.0 (0)	14.2 (66)
Literature/Arts	7.1 (30)	8.4 (36)	4.5 (19)	0.5 (2)	20.5 (87)
Math/Sciences	7.5 (32)	5.0 (21)	3.8 (16)	0.5 (2)	16.7 (71)
Politics/Economics	0.7 (3)	4.0 (17)	5.0 (21)	5.2 (22)	14.9 (63)
Psych/Anthropology	1.2 (5)	0.5 (2)	0.7 (3)	0.2 (1)	2.6 (11)
Religion	1.2 (5)	0.9 (4)	0.0 (0)	0.9 (4)	3.1 (13)
Total	36.7 (156)	31.4 (133)	20.0 (85)	11.8 (50)	100.0 (424)

Note. Percentages are based on total number of occurrences of all terms ($N = 424$) found in *The New York Times* between June 1, 1980 and October 28, 1988. Frequency levels are based on averaging the number of occurrences of the term over the 101 months of the *Times:* yearly = 0–100 occurrences; monthly = 101–436 occurrences; weekly = 437–3058 occurrences; daily = 3059 + occurrences.

Table 4

Percentage and Number of Sampled Cultural Literacy Terms Within Categories at Four Frequency Levels

	Yearly	Monthly	Weekly	Daily	Total
Category	% *N*	% *N*	% *N*	% *N*	% *N*
Geography	23 (15)	19 (12)	30 (19)	28 (18)	100 (64)
History	53 (26)	37 (18)	8 (4)	2 (1)	100 (49)
Idioms/Proverbs	61 (40)	35 (23)	5 (3)	0 (0)	100 (66)
Literature/Arts	35 (30)	41 (36)	22 (19)	2 (2)	100 (87)
Math/Sciences	45 (32)	30 (21)	23 (16)	3 (2)	100 (71)
Politics/Economy	5 (3)	27 (17)	33 (21)	35 (22)	100 (63)
Psych./Anthropology	46 (5)	18 (2)	27 (3)	9 (1)	100 (11)
Religion	39 (5)	31 (4)	0 (0)	31 (4)	100 (13)
Total	37 (156)	31 (133)	20 (85)	12 (50)	100 (424)

distribution in the original list, as the sample was not stratified. Table 4 accounts for this by presenting the percentage of examples from each category that fall into each of the time spans. Among the specific categories, geography held steady as might be expected; it plays a part in almost every article, if only as a dateline which is nonetheless important as a cultural literacy item for making sense of the article. Rankings for the geographical centers sampled, after New York and New Jersey, were London (38,930) and Houston (21,017), followed by Peru (11,843), Rome (9,888), Asia (8,368), and Vermont (8,289). Although it may be possible to account for the order after the top three, it is interesting to consider the events that have given the others such prominence over the last decade.

History, on the other hand, is not a high-frequency category. The important American concepts of "frontier" (5,092) and "imperialism" (1,107) did play a prominent part, but among historical figures in this sample, "Tito" (1,055) ranked first followed at some distance by "Alexander Hamilton" (491). Also of note in this category were "Cherokee" (584) and "Shawnee" (212) which *The Dictionary of Cultural Literacy* treats as historical entities.

Proverbs and idiomatic expressions also failed to play a substantial role in the newspaper. It should be noted that expressions were searched in part ("When in Rome") as well as a whole ("When in Rome do as the Romans do") to catch allusions to them, although some would still slip through, such as "When in Calgary . . ." But it also follows that the occurrence of a string of words will be less likely than a single term.

The arts, including a strong representation from literature, formed the most prominent category for the entire set overall. Yet its representation was not as strong at the most frequent level. The two most frequently cited terms were "genre" (3,852) and "motif" (3,160), perhaps reflecting the critical interests of the newspaper, with "baritone" (2,641) and "string quartet" (2,276) constituting the most popular musical forms.

The maths and sciences had a fairly even distribution with a rapid falling away at the high level. The most frequent science terms in the sample included "cell" (7,825), followed by "friction" (2,381), with support from its metaphorical uses in world affairs; "Einstein" (2,108) was the most popular figure in science.

Although the previous five categories have held their own or slipped in the high frequency levels, politics and economics present the most dramatic clustering at the high end, dominating the daily frequency column; this category comes closest to representing a current events approach to cultural literacy which Hirsch is cautious about, but it also included such timeless terms as "bureaucrat" (2,623) and "creditor" (5,055), as well as acronyms "SEC" (7,821), "CIA" (7,245) and "GNP" (4,894) that play an important part in the state of the culture.

The two similar contributors to the list were religion and an amalgam of psychology and anthropology. Although with such small numbers, it can be misleading to make too much of the way that religion held its own across the frequency levels, yet it did have representation among the top 30 terms, whereas psychology, sociology and anthropology got their boost from the diverse concepts of "tenure" (5,078) and "ghetto" (1,882) as well as the political associations of such terms as "charisma" (818) and "sexism" (607).

DISCUSSION

This initial profile of cultural literacy in the *Times* confirms the fact that Hirsch and company have identified a body of terms which plays a regular part in the daily commerce of the published language. The *Times* employs a number of the terms every day, and a majority of them every year (to be read, perhaps, once a decade). Although this lends credence to their method of selecting terms for the list, a closer look at the profile reveals areas of continuing concern for which studies such as this one can serve as a corrective.

For example, in the distribution by category, it is hardly surprising that a newspaper would give greater prominence to politics and economics than to literature and the arts, yet that needs to be considered in light of the fact that the reverse is the case for the Hirsch, Kett, and Trefil list. This study alerts educators to an element of *compensation*, or the playing of favorities, in Hirsch's program. That is, the categorical distribution of this random sample from the list does not match up with the distribution in a national publication that offers broad coverage of cultural concerns. This statistical profile, albeit of a single if influential source, can alert educators to the possibility of a discrepancy in Hirsch's claim that the list represents the state of the culture. Profiles such as the one provided here can guide educators such as Hirsch in adjusting the list to match the current state of the culture.

The poor showing of idioms and proverbs, as well as, to a lesser degree, history, suggests that more accurate methods can be employed to ascertain what terms and expressions constitute the bulwark of this culture. These findings speak to the limitations in the program's current claim to represent the vocabulary of such national cultural institutions as a newspaper of substance. The profile presented here suggests that there may well be prescriptive and compensatory elements to the list which seriously undermine its claimed descriptive function of a living culture. Educators about to introduce this vocabulary into their programs have a right to know what these lists reflect, whether the literacy of national publications, as Hirsch claims, or the informed opinions and interests of the Cultural Literacy Foundation.

There are, then, two sides to the results of this study. It has, to a degree, vindicated Hirsch's quest for a representative list. Hirsch's weak claim that the list plays a prominent part in the newspaper of substance receives a degree of substantiation, while the stronger claim that the fabric of the nation, as well as the newspaper, depends on the contents of this list needs to be set in perspective and further investigated. This study suggests that to be culturally literate in this set of terms will provide a small boost in comprehending a newspaper of substance. The other side of the coin is that it may be misleading to suggest that mastering this list will open the door to the *Times* or to the world of culture which it represents.

These findings highlight the fact that most of the newspaper is, using Hirsch's criteria, too specialized, too general, and too ephemeral to be a part of his cultural literacy. The *Times* would seem to contain a multiliterate culture and multicultural literacy which is what makes it a national publication. The daily newspaper is full of specialized areas of reading interest, whether in books, movies, fashion or sports, as well as the "news"; it is rich in passing events that swell up in the paper for only a few weeks or months, the Oliver Norths of the news, before passing into the annals of trivial pursuit. We are each specialized and ephemeral readers, and without those interests, it is hard to imagine reading the *Times* or any newspaper at all. But equally so, the Oliver Norths are crucial in understanding the state of the democracy at any given moment.

A second interest in this study is the electronic database itself. It is undoubtedly a useful research tool in substantiating claims about a national vocabulary; lexicographers, for example, have begun to use such databases to assess the status of new words and meanings (Willinsky, 1988). In this research, the next logical step is to search further periodicals in electronic form and also to begin to analyze *how* these terms of cultural literacy function in the context of the articles in which they appear. Questions can be raised about the degree to which the term contributes to the meaning of a piece and takes its meaning from the context, as the text can be said to teach the term. A second point to consider is using the database as an educational tool. Instead of learning terms ascertained by a committee of a hundred scholars, students could use such databases, once the cost of searching the database becomes less prohibitive, to become their own investigators into the current life of the language and culture.

Hirsch's proposal that a vocabulary of cultural literacy should form the core of American education has raised a number of important issues. Two areas of investigation seem especially pertinent for educators considering the introduction of such programs into their jurisdictions. Although it has been proven by Hirsch (1987) and others that relevant background knowledge and vocabulary improves comprehension, it has still to be established that a defined lexicon of cultural literacy plays an essential role in the wide range of communication activities that constitute the democratic state. The second point that requires further research is the degree to which an education in such a form of literacy will enhance the learner's opportunities for participation in this national enterprise. Searching electronic databases of a prominent periodical is a small step, admittedly, in ascertaining the validity of Hirsch's claims and providing a more accurate picture of the literacy that sustains the commonwealth. But there is little question that these claims must be investigated thoroughly by the means at our disposal, if we are to make wise choices for the future of schools and society.

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WHEN PRIOR KNOWLEDGE DOESN'T FACILITATE TEXT COMPREHENSION: AN EXAMINATION OF SOME[1] OF THE ISSUES

Ann J. Pace
University of Missouri—Kansas City

Nancy Marshall
Florida International University

Rosalind Horowitz
University of Texas—San Antonio

Marjorie Y. Lipson
University of Vermont

Patricia Lucido
Northwestern Missouri State University

The role of prior knowledge in comprehension has been a (if not *the*) central focus of reading research and theory for more than 12 years. The thrust of most of this literature has been on the facilitative role of prior knowledge in comprehension. Appropriate prior knowledge is seen as essential for adequate text comprehension; problems in comprehension are ascribed to deficits in prior knowledge. Although few people probably would dispute the validity of this general scenario, there is growing awareness that it is not complete, that the picture is more complex than usually drawn.

Recognition of some ways in which existing knowledge can inhibit expected comprehension has existed in the literature for a number of years. Personalogical and attitudinal variables that affect how people process information, differing perspectives arising from disparate experiences, and strength of various belief systems are all acknowledged constraints on text comprehension. What has emerged recently, however, is an increasing appreciation of specific kinds of preexisting ideas about the world that can seriously affect comprehension or learning of new information.

This paper explores several issues related to this general concern and reports results of data collected from the audience at the 1988 annual meeting of the National Reading Conference. Conceptual, empirical, sociolinguistic, and diagnostic perspectives on the role of prior knowledge in comprehension are considered.

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[1] This article represents the collaborative efforts of several individuals. The introductory sections were written by Ann Pace and Nancy Marshall and the section on science misconceptions by Ann Pace and Patricia Lucido. Rosalind Horowitz was primarily responsible for the section on sociocultural considerations, Majorie Lipson for the part on prior knowledge and reading disability, and Nancy Marshall for the concluding section. The entire chapter was edited by Ann Pace.

EXPANDING OUR UNDERSTANDING OF PRIOR KNOWLEDGE

Before directly addressing empirical and theoretical issues relating to prior knowledge, an attempt will be made to clarify the definition of prior knowledge by examining two alternative sets of assumptions about this construct found in the research literature. The first set of assumptions are those upon which the majority of studies into effects of prior knowledge on new learning have been based. These include:

1. Prior knowledge is primarily cognitive. It is the product of semantic operations used to organize experience and information in memory.
2. Prior knowledge is structured. It consists of sets of concepts connected through various kinds of relationships. Different aspects of prior knowledge may be represented through propositions, semantic maps, and schemata.
3. Prior knowledge is content, which is potentially transferable, intact, from one person to another.

There is an alternative set of assumptions that could open up a new way of studying prior knowledge. These assumptions are:

1. Prior knowledge is influenced by many affective factors such as personal beliefs and commitments to these beliefs. Concepts with which affective components are associated tend to be viewed personally and are therefore more resistant to revision.
2. Prior knowledge results from both semantic and episodic memory (Tulving, 1972). Much of it derives from direct personal experience that is not categorized logically. As a result, the presumed match between new information to be learned and a person's existing knowledge may be more apparent than real.
3. Prior knowledge is dynamic. It is constantly evolving to meet specific needs of the learner. Thus, even newly learned information may already have been modified by the learner and thereby no longer match an instructor's interpretation of the material.

The second set of assumptions are more consistent with the definition of "schema" that Bartlett (1932) introduced. A schema, according to this view, is a group of operations that is used to create knowledge needed for accomplishing a task, rather than the knowledge itself. This definition of a schema resembles that used by Kant, from whom Bartlett derived the term.

Such a view makes the role of prior knowledge more complex and complicates the role of the instructor. It may, however, help explain many of the findings from research on misconceptions and prior knowledge (e.g., Alvermann & Hynd, 1986, 1987; Maria, 1987, 1988; Marshall, 1987, 1988).

INTUITIVE CONCEPTIONS AND MISCONCEPTIONS IN SCIENCE: SPECIFIC CASES OF INTRACTABLE PRIOR KNOWLEDGE

During the past several years, science educators have become increasingly concerned about science misconceptions, deep-seated beliefs or explanations about a number of natural phenomena that conflict, in fundamental ways, with scientific accounts of these phenomena. Although these beliefs variously have been termed "misconceptions," "naive theories," "intuitive conceptions," or "alternative frameworks," descriptions of how they operate are highly similar.

Most misconceptions that have been identified relate to physical phenomena, though there are also examples from biological and earth sciences. They are held by children and adults, including college students (such as preservice education majors) who have had one or more courses in physical and biological sciences.

What makes science misconceptions intriguing and frustrating is that they appear to be held so firmly that they resist change through traditional classroom instruction or well-structured texts (Anderson & Smith, 1987; Carey, 1986; Linn, 1986). The admonition that new information must be connected to students' existing knowledge if meaningful learning or comprehension is to occur has been widely accepted. Yet, misconceptions offer rather clear examples of cases where prior or existing knowledge *impedes* or *inhibits* comprehension, rather than facilitates it.

When students' existing conceptions differ fundamentally from scientific explanations provided by the curriculum, conflict—not comprehension—is likely to occur (Pines & West, 1986). Not infrequently, students may be able to respond correctly to test items, and even get good course grades, yet fail to understand the essential nature of scientific concepts they have studied (Anderson & Smith, 1987).

Misconceptions apparently arise out of the very natural attempt to make sense of the world, that is, to provide explanations for the way observable phenomena seem to function or act (Anderson & Smith, 1987; Linn, 1986; Pines & West, 1986). According to Anderson and Smith (1987, p. 90), ". . . students spontaneously construct theories that help them interpret familiar phenomena before they begin formal science instruction. These naive theories are usually understandable and sensible; they are in accord with common experience and everyday language; and they provide reasonable explanations of what we see around us." The problem is that these "naive" conceptions or conclusions seem perfectly reasonable to the people who hold them, while the relevant scientific explanations may appear counter-intuitive. Because misconceptions evolve from personal efforts after understanding, people develop strong, affective commitments to them (Marshall, 1986), which make them especially hard to change or modify.

Science misconceptions are not random. Similar misconceptions about phenomena consistently appear, both within and across age groups (Linn, 1986), perhaps because of the seductive nature of naive observations of the physical universe. For example, many people confuse weight with volume and falsely conclude that a heavier object, such as a cube of steel, will displace more liquid than a lighter object of the same size, as a cube of aluminum of comparable volume (Linn, 1986).

Misconceptions, though, are not simply false ideas, but conceptual systems with certain basic core ideas (Carey, 1986; Linn, 1986) that are stubbornly maintained, even in the face of contradictory evidence. Students, in fact, have been known (Linn, 1986) to change accurate peripheral observations to maintain the integrity of inaccurate core concepts. (For example, if a person believes that wood floats but metal does not and acknowledges that a ferry has stayed afloat, he or she may change, when questioned, an accurate recollection of a metal ferry boat and say it was made of wood.)

Misconceptions, then, are like minitheories about observable phenomena. In fact, several writers (e.g., Anderson & Smith, 1987; Carey, 1986) have compared them to historically early theories about the physical universe. To the extent that this anology is apt, theory change similar to that which has occurred in the history of science may be needed for individuals to alter their misconceptions. That is, some kind of fundamental conceptual change may be required before students can be induced to abandon their misconceptions, since these explanations have appeared to serve them well. Traditional instruction, even when well structured and clear, may not be able to accomplish this (Anderson & Smith, 1987; Linn, 1986; Pines & West, 1986).

Further, the way students use texts may preclude their obtaining adequate understanding of information being presented. For example, some studies (e.g., Eylon & Reif, 1984), have shown that students studying physics tend to rely more on examples than on the text. They then overgeneralize the conclusions they draw from these examples to inappropriate new situations.

Several authors have offered similar recommendations for dealing with conceptual change (Anderson & Smith, 1987; Linn, 1986; Nussbaum & Novick, 1982; Pines & West, 1986; Reif, 1987; Viennot, 1979). These suggestions usually involve a sequence of three steps. First, misconceptions must be brought to light. Students should be made explicitly aware of misconceptions they hold. Second, "correct" scientific explanations, which contradict students' misconceptions, should be presented, thus inducing cognitive dissonance or disequilibrium. Third, students should be helped to resolve the dilemma, until they can understand and truly accept the scientific explanation of the phenomenon in question.

Technology, such as interactive videodiscs, may help in this process. Also, amended texts or "metatexts," probably along with the altered teaching methods, can be used to facilitate change (Alvermann & Hynd, 1986, 1987, 1988; Hynd & Alvermann, 1986; Maria, 1987, 1988; Roth, 1985). Crucial to conceptual change, however, is helping students become more reflective about and evaluative of their own ideas, their observations, others' observations, and contradictory data. It is also important to be alert to other domains where similar kinds of misconceptions may arise and which need to be identified to make sure real understanding can take place.

DIFFERING SOCIOCULTURAL PERSPECTIVES AND TEXT COMPREHENSION

Another aspect of prior knowledge that can influence text comprehension is the sociocultural background a reader brings to text processing and school learning. Although sociocultural factors have not been addressed extensively in the reading research literature, they clearly play a role in the way children and adults process or produce texts. More broadly, accumulating evidence indicates students from disparate cultures have fundamentally different experiences of schooling (Tharp, 1989).

Sociocultural factors include social schemata or models in memory based on recurring social situations; contextual factors; person perceptions; attributions, attitudes, and beliefs; cultural frames and reference; regional, ethnic, and religious affiliations; and socioeconomic status, as well as other social group affiliations (see Chall & Jacobs, 1983; Giles & Robinson, 1989; Horowitz, 1986; Kintsch & Greene, 1978; Lipson, 1983; and van Dijk, 1987). Sociocultural factors result in different habits and conventions about communication. Thus, they may lead to misunderstanding or differing interpretations of texts and should be considered by reading researchers.

Literature dealing with sociocultural factors in oral communication has identified several sources of miscommunication, such as discourse confusions or biases, lack of trust in a message or sender, message distortions and confusions, prejudices, ethnocentrism and egocentrism. Yet, in the reading comprehension literature, the picture presented is mostly one of veridical recall of propositions and linguistic structures, suggesting that reading is a more accurate and better avenue for processing communication than speech. Although this is possible, what is more likely is that reading research has yet to address many relevant questions considered in these other literatures.

Theoretical and empirical work in these areas demonstrate that social group affiliation can play a role in acquisition of meaning from discourse. Sociocultural factors influence cognitive structures we use in reading, our attitudes and feelings about the worth of a topic or specific content, the approach we use to process information, our willingness to interact with text (Willinsky, 1987) and accept information (Walker & Rakow, 1985), and the final outcome of reading. Social psychological studies of discourse, foreign language or English-as-a-second-language (ESL) research, discourse analysis research, and studies of conversation all bring relevant insights to consideration of these issues.

For several decades, social psychologists have studied how social factors influence communication and, particularly, oral persuasion. For example, order of text content has been shown to interact with listener variables in shaping and changing attitudes of listeners (Hovland et al. 1957). Related work shows listeners come to a speech with various attitudes and belief systems, including beliefs about a speaker. More recently, Forgas (1981), Rommetveit (1984), and Johnson-Laird (1983) have shown how representations of past events (including childhood experiences) and socially shared systems of rules and norms influence processing of new events. This social knowledge may be particularly important for studying adolescents' processing of text and lectures by teachers, who may or may not be viewed favorably by students.

Foreign langauge and ESL research have shifted recently from an exclusive focus on how best to teach students to *speak* a foreign language to include research on *reading* a new language. Foreign language research has for some time addressed the role of attitudes and motivation, as well as affect, in learning to communicate in a second tongue. Work by Krashen and his associates (Dulay, Burt & Krashen, 1982) stresses the role of the "affective filter" in learning and the importance of "comprehensible input" in knowledge acquisition in an unfamiliar, low prior-knowledge area. Inaccurate understanding of concepts, ideas, assumptions, or experiences expressed in the second language can lead to problems in comprehension.

Reading and language learning are also affected by social group affiliations and identifications. Walker and Rakow (1985), for example, show how Hispanic students' study of science can be affected by their negative attitudes toward specific science content. Hispanic students (especially females) tended to see the content as being in conflict with their own social and religious group beliefs. Finally, Carrell's (1984) work on text structures demonstrates that particular language groups may be more sensitive to some structures in text than others because of certain thought patterns associated with their culture.

In the past decade, discourse analysis research has begun to examine interactions among a number of factors in discourse processing. These factors include attitudes toward ethnic minorities; social situational variables in learning or processing information; and regional, religious, SES, or sex differences. Of particular interest are the contributions of van Dijk on ethnic minorities in his book, *Prejudice in Discourse* (1984), reporting on majority talk about minorities in Amsterdam neighborhoods. He noted distinct attitudes and mental models majorities hold about minority neighbors that are expressed in discourse (dialogues) and that influence communication processes they have with minority members. Van Dijk identifies lexical and syntactic features, as well as superstructure and macrostructures, that exist in prejudiced communication. These exist in a variety of settings and may even be found in school textbooks and in teacher-led discussions about these books.

Conversation has been studied by a number of researchers interested in the communication process. This work has important implications for classroom discourse and text processing. In a recent paper, Blum-Kulka and Weizman (1988) argue for the inevitability of misunderstanding in ordinary talk. Whether or not the communication was negotiated, the authors found communicators possessed contradictory perceptions and confusions about the meaning of particular interactions. This study illustrates that levels of misunderstanding may remain covert, yet prove critical to communicative interaction.

At this time, little is known about how sociocultural perspectives or linguistic differences may generate text confusions or misunderstandings, why they emerge, who is to blame, (author, reader, or teacher), or how they can be remedied in schools. Expanding our understanding of prior knowledge to recognize the influence of sociocultural factors is of paramount importance for the field of text processing and school learning. Among other things, we need to find ways of identifying what sociocultural perspectives students and teachers bring to text comprehension and learning. A number of questions should be addressed, including the following: (a) What schemata for social situations are applied to particular topics by students of given ages? (b) What attitudes and beliefs do students hold that they may complement or interfere with text processing? (c) Can, or should, these attitudes and beliefs be changed through classroom intervention, or how may instruction be adjusted to accommodate them? (d) What particular difficulties do ethnic minority students face in processing a text or teacher-based discussion which derives from a culturally different viewpoint? (e) How might social group affiliation be used most effectively in designing reading and discussions in classrooms? (f) What convinces readers to accept or reject a point of view in a text when it contradicts students' cultural beliefs?

The timeliness of this inquiry needs emphasis. We are seeing increasing cultural diversity in schools. Changes in textbooks reflect various social and cultural values. We are establishing new goals for schooling, with greater attention to learning as a contextual phenomenon. Finally, we hope to develop greater appreciation and understanding of sociocultural and cognitive factors which influence learning and text comprehension.

PRIOR KNOWLEDGE AND READING DISABILITY

Little is yet known about the relationship between prior knowledge and reading disability. There are several ways in which aspects of prior knowledge might influence reading performance. It has generally been assumed that differences in performance are attributable to *schema availability*, although distinctions between availability and accessibility were noted many years ago (Tulving & Pearlstone, 1966). In addition to schema availability, Spiro (1980) suggested that individuals might have difficulty in the following areas: (a) schema selection, (b) schema maintenance, and (c) schema instantiation.

Schema Availability

The central issue regarding availability concerns the degree to which reading disabled students possess less overall prior knowledge. Langer (1984) found activation of prior knowledge aided comprehension for average and above average readers, but not for below average readers. Since passages were the same for all readers, Langer suggested the least able readers probably needed to be instructed in underlying basic concepts. Thus the possibility exists that poor readers have more limited conceptual knowledge to draw upon while reading.

One aspect of reading disabled students' prior knowledge has been examined quite closely—knowledge of, and memory for, structural features of stories. McConaughy (1985), for example, studied summarization recalls of good and poor sixth-grade readers. When the task required summarization of what poor readers thought was important, rather than recall of as much as possible, poor readers' story schema organization was as good as that of good readers of the same age. This conclusion is consistent with Weaver and Dickinson's (1979) finding that learning disabled readers were equivalent to good readers in their general knowledge of story structure. In general, findings suggest there are consistent differences in quantity of recall for narrative text, but there are no differences in quality or accuracy of recall (see Worden, 1986), suggesting disabled readers have appropriate story structures available for comprehension.

Although results are not unequivocal, there is substantial evidence to suggest that when reading material is not too difficult (Taylor, 1979), or when material is highly familiar (Allen, 1985), both good and poor readers use essentially the same "knowledge-based" strategies. Lipson (1982) found average and poor readers were influenced similarly by prior knowledge in several ways. In both groups, text familiarity related positively to reading rate and accuracy in answering questions. She also reported, however, that inaccurate prior knowledge interfered with comprehension more than no knowledge at all. It is possible, therefore, that poor readers possess more inaccurate knowledge than good readers, a possibility not tested in this study.

In general, findings of these studies indicate less able readers use prior knowledge to facilitate comprehension in ways similar to those employed by better readers, but some groups of students may be disabled by limited or inaccurate prior knowledge in specific reading tasks. The possibility that poor readers may have less accessible (versus available) knowledge is explored below.

Schema Accessibility

Evidence exists that poor readers do not use prior knowledge as well as good readers do, especially when learning from expository text (Holmes, 1983; Maria & MacGinitie, 1982), reflecting a problem with schema accessibility. There are many reasons why individuals might underuse available knowledge (Spiro, 1984), but only the relationship between reading demands and knowledge structures are considered here.

In the literature just reviewed, prior knowledge tends to be viewed as more-or-less dichotomous—it either exists or it does not. However, prior knowledge is not an either-or proposition. The schema for a given topic may be incomplete, vague, ill-defined, or completely inaccurate. As Bransford (1984) has noted ". . . students may have developed partial schemata that are sufficient for understanding some types of statements but not for understanding others" (p. 395). Researchers have failed to explore the possibility that subjects may lack, not facts, but an understanding of relationships among facts that they do know. Partial schemata may result in resources that are not "accessible" because they are not fully developed, are poorly organized, or are embedded in inappropriate superordinate networks.

Other researchers have suggested disabled students' failure to use acquired skill and knowledge represents a "production deficiency" (Brown, 1980) and have characterized the disabled reader as "inactive" (Torgesen & Licht, 1983). In this case, reading comprehension may be hampered because readers fail to activate relevant knowledge they possess. Lipson (1986) has argued that activation of prior knowledge is helpful only under some conditions and that, in addition, prior knowledge, reading expertise, and confidence appear to interact in as yet unspecified ways.

Spiro (1980) has noted that it is *not* true that schema availability is a *sufficient* condition for successful top-down processing—available schemata also have to be used correctly and efficiently. His comment suggests schema availability and accessibility are important, but failure to comprehend may also result from processing deficits associated with aspects of prior knowledge use, such as schema maintenance and instantiation.

Schema Maintenance

Schema maintenance requires not only that readers continue to employ appropriate knowledge structures as they interact with text, but that they discard old information for ongoing reading comprehension and learning. MacGinitie and his associates (MacGinitie, Kimmel, & Maria, 1980; Maria & MacGinitie, 1982) identified two groups of poor readers who appeared to have difficulty with schema maintenance. "Non-accommodating" readers accessed related topical knowledge, used only limited aspects of text, and subsequently referred to text in only limited ways. They appeared to be, " . . . not much constrained by the information in the text" (Maria & MacGinitie, 1980, p. 14). Another kind of poor reader has been described by Kimmel and MacGinitie (1984) as using a "perseverative strategy." They note that this reader, ". . . forms hypotheses but fails to evaluate and modify them appropriately on the basis of subsequent text" (p. 164).

Schema Instantiation

Readers who fail to adequately "instantiate" text information into existing schemata appear to access schemata effectively, but do not combine them adaptively to fit the needs of a given text-processing situation. Alternatively, they may fail to use comprehended information to update and modify their existing knowledge structures, as the studies by MacGinitie and his colleagues indicate. In addition, Maria and MacGinitie (1980) describe another subgroup of children who make no attempt to build meaning from idea to idea in text. Rather, they adopt new schemata throughout, ". . . and seem unaware of the contradictions that arise when they apparently apply first one schema then another in interpreting the text" (p. 14).

Two studies by Lipson (1982, 1983) suggest that schema instantiation is a potential problem for able as well as disabled readers. Both average and poor readers performed better on completely new information than on partially familiar material. Data suggested that building knowledge structures may not be as problematic as integrating and accommodating information into existing ones. The troubling aspect of Lipson's (1982) study is that readers were most likely to have difficulties instantiating text information when they possessed inaccurate or partial knowledge. To the extent that less able readers acquire partial knowledge structures over time, they may indeed be handicapped by inability to use new knowledge effectively to disconfirm inaccurate preexisting knowledge.

Findings and implications of studies regarding schema availability, accessibility, maintenance, and instantiation in relation to disabled readers also have implications for problems reviewed previously concerning science misconceptions and sociocultural factors in comprehension. Beyond identifying and clarifying what the sources of these problems are, continued close analysis of how partial, inaccurate, or simply different prior knowledge can influence or interfere with text comprehension is needed to realize more fully how text structure and classroom instruction might be adjusted to deal with these concerns.

ADDENDUM: VIEWS OF PRIOR KNOWLEDGE

People who attended the symposium upon which this paper is based were requested to complete a survey form designed to elicit their understanding of prior knowledge. The survey form had two parts. In the first, respondents were asked to list five terms they associated with prior knowledge. In the second, they rated 30 terms for closeness to the concept of prior knowledge, using a 5-point scale, with "5" representing complete relationship and "1" representing no relationship. All 30 terms have been used in research literature in relation to prior knowledge.

More than 50 people attended the symposium; of these, 38 returned the survey form. Twenty-one of the returned forms were complete, and 17 had only the second part completed. Responses were tallied, and an attempt was made to detect patterns. This was done by counting the number of times a term was listed in the first part, by counting the frequency with which each listed term was assigned a rank, and by summing rank scores for each listed term and computing a median and interquartile range for the ranked sums. All procedures produced similar results.

Terms listed most frequently on part one and ranked highest on part two were the same. These (with summed ranked scores in parentheses) were: *experience* (198), *schema* (178), *network* (162), *structure* (159), *association* (153), *concept* (152), and *relation* (152). These terms were those in the top quartile of the ranked sums and accounted for 32 of the 40 terms which matched those on the list generated by respondents.

All these terms are closely related to the first set of assumptions listed at the beginning of this paper. They can be characterized as representing a cognitive, structural view of prior knowledge. Further, terms in the bottom quartile reinforce this conclusion. These were *confidence* (95), *creativity* (97), *intuition* (110), *commitment* (113), *personality* (15), *deduction* (117), and *induction* (118). With exception of the last two, these terms are more related to affective, motivational, or individual difference characteristics, than cognitive ones. This further illustrates the strong tendency for the majority of respondents to view prior knowledge as a language-centered, primarily cognitive phenomenon.

Although the majority of respondents represented the cognitive point of view, about one-third ranked affective and personality factors as having strong relationships to prior knowledge. They tended to associate *perspective, beliefs, point of view*, and *interest* with prior knowledge. This minority view of prior knowledge is more consistent with the second set of assumptions presented earlier in this paper and allows for effects of individual differences and needs on new learning.

It is interesting that the informed participants who completed the survey tended to take a conservative, purely cognitive view of prior knowledge. The data do not permit speculation about the reasons for responses of participants, but they do emphasize that continued dialogue about the nature of prior knowledge and prior knowledge research is essential. Issues raised here represent one effort to extend this discussion.

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THE USE OF A COMPOSING STRATEGY FOR TEACHING STUDENTS TO LEARN FROM NARRATIVE TEXT

Victoria J. Risko
George Peabody College, Vanderbilt University

Alice Patterson
East Middle School, Metro Nashville Schools

This research was designed to examine the effects of rehearsing text ideas on low achievers' written story retellings, using three methods of instruction. Students were encouraged to rehearse story ideas through a notetaking and reflection strategy, a group verbalization composing and concept mapping strategy, or a thematic organizer combined with the group composing strategy. Although research on notetaking to aid reading comprehension has produced mixed results, Weinstein and Mayer (1986) view notetaking as a complex rehearsal task that is effective when it allows time for learners to select and practice information-gathering strategies. Notetaking may be beneficial because it aids learners in directing attention to specific text ideas (Anderson & Armbruster, 1984; Weinstein & Mayer, 1986) and allows learners to reflect on ideas presented in the meaningful context of narrative or expository passages.

Recording group verbalizations during reading, another form of notetaking, encourages a group of students to share and rehearse information it selects from the text. Verbalizing one's thoughts during the reading process (think-alouds) or the writing process (compose-alouds) has been associated with facilitating recall and organization of written compositions (Easton, 1982; Fagan, 1981; Hare & Smith, 1982; Hayes & Flower, 1980; Lytle, 1985; Newell, 1984; Olshavsky, 1976–1977; Schoenfeld, 1982; Schumacher, 1983; Strahan, 1982). However, our previous work (Risko & Smartt, 1982) with think-alouds supports the notion advanced by Weinstein and Mayer (1986) that rehearsal strategies alone do not seem to help students establish internal connections between text ideas or relate text information to prior knowledge. We found low-achieving readers, in particular, are often unable to differentiate important from less important ideas or to identify central concepts required for understanding text ideas.

Such findings plus an analysis of cognitive research on thinking and problem solving (e.g., Bransford, Sherwood, Vye, & Reiser, 1986; Vygotsky, 1978), suggest that mediated learning activities can enhance effects of rehearsal strategies. Cognitive researchers (e.g., Bransford, Sherwood, & Hasselbring, 1988) indicate that mediated learning in classrooms should occur within natural learning contexts, much like shared learning experiences that occur between parents and children at home. Observations within natural learning contexts (Chapman, 1978) suggest children have rich opportunities for using contextual cues to interpret language and actions of others. Further, parents who act as mediators by helping their children make sense of experiences can influence cognitive development (Fuerstein, 1979; Vygotsky, 1978) and meaningful learning (Chapman, 1978). Similarly, teachers who share learning experiences with students can serve as mediators by helping students separate relevant from irrelevant information, prompting students to anticipate events, and helping them connect parts of their experiences or ask questions about the text they will read.

Theorists such as Feuerstein (1979) and Vygotsky (1978) argue that some forms of mediation may be more effective than others in developing thinking skills. They suggest that instead of leading discussions that put an emphasis on right answers to predetermined questions, effective mediators should focus attention on processes, such as selecting and evaluating text ideas, needed for reading comprehension. Novak and Gowin (1984) indicate that teachers can provide support for students' learning by helping them make decisions about important text ideas and construct meaningful connections among text ideas through activities such as concept mapping.

We believe, therefore, that rehearsal strategies may allow students time to focus attention on ideas within a meaningful context, but mediated learning activities associated with rehearsal can provide students with multiple elaborations on the content which may enhance the quality of students' comprehension (Anderson, 1983; Anderson & Reder, 1979; Risko & Alvarez, 1986).

This study examined the effect of a composing strategy, developed to mediate students' learning in a language-rich discussion activity, on low-achieving students' written retellings. We analyzed written retellings of students participating in (a) a composing strategy, (b) a variation of the composing strategy in which a prereading activity was added to highlight central text information, and (c) a notetaking strategy. Across all conditions, students were asked to read narratives. Second, we investigated the possibility of differential effects of these strategies on written retellings when students read narratives containing two organizational patterns that deal with temporal/sequential events in a story.

METHOD

Subjects

The participants were 13 sixth and 13 seventh graders enrolled in a remedial reading program in an inner-city school. Students' percentile scores on reading subtests of the Stanford Achievement Test (Gardner, Herbert, Karlsen, & Merwin, 1983) were in the range of 10 to 30, and these students were identified by their reading teachers as exhibiting reading comprehension problems in at least one of their content classes.

Materials

Materials for the introductory session were short stories taken from the students' basal workbooks. Stories for the two intervention sessions, presented in this order, were "Keplik, the Match Man" by Myron Levoy and "The Fun They Had" by Issac Asimov, taken from *Reading Literature* (Chapparro & Trost, 1985), a supplementary text used by the students' language arts teachers. The structure of the first story was organized according to a chronological, sequential order. The structure of the second story was written with inverted time order, written in a future tense with flashbacks to the past.

Photocopies of entire stories, with illustrations, were read by the students. Prior to the study, the investigators divided each story into three meaningful parts determined by the presentation of structural elements of the story. For example, the first pause occurred after the setting and the protagonists' goal had been introduced. Each story was divided into approximately three equal units, with slashes placed at the end of each pausal unit.

Procedure

Students across grade levels were randomly divided into three groups. Each group was assigned to either the notetaking group ($n=8$), the thematic organizer/composing group ($n=8$), or the composing group ($n=10$). Each group met for 3 days. The first day was an introductory session. The researchers and one trained assistant were randomly assigned to one of the intervention groups and worked with this group throughout the study. The lessons for each day were scripted for consistency across all groups. The same materials were used with all groups. Time was held constant across all group activities (i.e., 25 minutes were assigned to story reading and pauses for rehearsal, 10 minutes were assigned to reflection on notes or concept mapping, and 10 minutes were allotted for writing retellings).

During the introductory session, each group received practice on its method of instruction. For each group, the students and teacher read the assigned short stories and paused to practice the appropriate rehearsal strategy. In the notetaking group, the teacher and students explained how they would choose story ideas and write these in their own words for their notes. Writing text ideas "in their own words" was a strategy used frequently by these students in their content classes. The composing strategy had two phases. First, the students and teacher verbalized their thoughts during the preselected pauses in the story and, second, students assisted the teacher in constructing a group concept map after reading the entire story. The second phase of the composing strategy was instituted to help students identify central concepts of the text and form relationships among important and less important information. Concept maps were constructed in a hierarchical format following the procedure identified by Novak and Gowin (1984). After all instructional activities were concluded, students were asked to review their notes or concept maps as they wrote a retelling of their story. They were told that on the 2 subsequent days, these aids would not be available during the retelling activity.

On each of the following 2 days, students in the notetaking group were presented with a one-sentence general statement that introduced them to the main idea of the story and were instructed to read the designated section of text. After pausing, students were directed to take notes as described above. The students were also directed not to read any further until all the students had completed writing. This procedure continued until all three parts of the story were completed. The teacher then directed students to look back over their notes, to designate ideas they wanted to remember, and to think about how they would tell the story in a written retelling. After providing time for student reflection, the notes were collected, and students were instructed to write everything they could remember.

The thematic organizer/composing strategy group (hereafter referred to as the thematic organizer group) initially received a thematic organizer (Risko & Alvarez, 1986). The content of the organizer connected story information to general experiences believed to be relevant to students' prior knowledge (i.e., characteristics of a house and things that make you happy) and required students to make predictions about what they would read. After reading the organizer and writing their predictions, students read the first designated portion of the text. Then the teacher and students shared what they thought were important ideas of the paragraphs. Responses were placed on an overhead transparency. This procedure was followed for the three sections of the text, with verbalized ideas placed on a new transparency each time. After the story was completed, the teacher and students reviewed ideas by taking turns to read ideas from all transparencies. Next, the teacher asked students to discuss and identify one idea that best told what the story was about. The teacher wrote this on the board and drew a circle around it. The teacher asked students to identify the next imporant ideas and to explain how they were related to the idea in the first circle. She continued in this manner until ideas generated by students were mapped at their respective, hierarchical levels. When students and/or the teacher disagreed with the selection of story ideas, discussion continued until a consensus was reached. Once the story was mapped, the teacher asked students to think about the map before it was erased. Students were then asked to write everything they could remember about the story.

The third group, the composing strategy, followed the same procedure as the second group, with the exception that a thematic organizer was not provided prior to reading. Instead they were introduced to the story with the one-sentence general statement given to the notetaking group.

Scoring

Two procedures were used to score the retelling data. The first evaluated the retellings for idea units. For this procedure, each story was parsed into idea units using Novak and Gowin's (1984) classification system for identifying salient text concepts representing the gist of the story (interrater reliability for two independent raters was .93). The two stories contained 29 units and 26 units, respectively. Then scripts of students' retellings were divided into idea units using the same classification system (interrater reliability, .94) and matched to their text counterparts (interrater reliability, .96). The second scoring procedure used Morrow's (1986) scoring system to evaluate students' generation of story grammar elements. Each retelling was scored using the following categories of story grammar: setting, theme, plot episodes, resolution, and sequence (interrater reliability, .94).

RESULTS

Data were analyzed separately for each scoring procedure. For recall of idea units, data were analyzed in a two-way ANOVA (group × day) with repeated measures for

Table 1

Means (and Standard Deviations) for Idea Units in Student's Written Retellings for Three Treatment Groups

		Day 1[a]		Day 2[b]	
Group	*n*	*M*	*SD*	*M*	*SD*
Thm Org	8	12.70	5.02	15.30**	3.77
Compose	10	8.37	3.91	12.37*	7.21
Notes	8	9.34	2.21	4.71	2.47

[a] Maximum score possible = 29.
[b] Maximum score possible = 26.
*$p<.05$. **$p<.01$.

the two narratives. See Table 1 for means and standard deviations for the total idea unit scores. There was a significant two-way interaction (group × day), $F(2, 23) = 6.62$, $p<.01$. In the one-way analysis, only group was significant. Analyses using the Tukey post hoc test revealed that the thematic organizer group mean was significantly higher than the means for both notetaking and composing groups for day 2 (12.70 vs. 9.34 and 8.73, $p<.05$). From Day 2 to Day 3, the notetaking group mean decreased substantially while the means for the thematic organizer and composing groups increased (4.71 vs. 15.30 and 12.37), thus creating the interaction effect.

For the story grammar scoring procedure, data were analyzed in a two-way ANOVA (element × day) with repeated measures for the two narratives. See Table 2 for means and standard deviations for these scores. The analysis of variance for these data revealed no significant two-way interaction for element × day. The one-way analyses of time, $F(1, 23) = 18.38$, $p<.01$, and element, $F(4, 92) = 31.23$ $p<.01$, revealed significant differences. The Tukey test for post hoc analyses revealed that for Day 2, the thematic organizer group and the composing group were significantly different from the notetaking group on recall of plot elements ($p<.05$), and the composing group was significantly different from the notetaking group on recall of story resolution ($p<.05$). For Day 3, the composing group was significantly different from both the thematic organizer and the notetaking groups on recall of story setting ($p<.05$). The thematic organizer group and the composing group were significantly different from the notetaking group on theme and plot elements of the story ($p<.05$). Across days, notetaking students' performance on recall of theme information was significantly different ($p<.05$). All remaining effects were nonsignificant ($p>.05$ for all).

DISCUSSION

Although more time is needed to establish whether our findings would remain stable over time, several results of this investigation can be discussed. First, groups who received either the thematic organizer in combination with the composing strategy or the composing strategy alone significantly outperformed students receiving the

Table 2

Means (and Standard Deviations) for Story Grammar Units in Students' Written Retellings for Three Treatment Groups

	Day 1			Day 2		
	Thmorg[a]	Compose[b]	Notes[c]	Thmorg[a]	Compose[b]	Notes[c]
Setting	5.69	5.75	5.31	4.69	7.25**	4.69
	(1.13)	(2.06)	(2.09)	(1.60)	(2.19)	(2.82)
Theme	8.13	9.50	7.50	6.31*	5.50	1.88
	(2.32)	(1.58)	(2.67)	(3.41)	(4.38)	(3.72)
Plot	8.75*	10.00*	6.25	8.75*	7.50*	3.13
	(2.32)	(.00)	(3.54)	(2.32)	(3.54)	(3.72)
Resolution	2.08	5.00*	2.51	3.31	2.90	1.68
	(2.48)	(1.79)	(3.47)	(3.09)	(2.39)	(3.10)
Sequence	7.19	5.75	5.31	4.06	3.25	2.50
	(2.48)	(4.26)	(4.11)	(3.52)	(3.74)	(3.54)

Note. Maximum score possible for each story grammar unit was 10.

[a] $n = 8$.

[b] $n = 10$.

[c] $n = 8$.

*$p < .05$, groups a and b are significantly different from group c. **$p < .05$, group b is significantly different from groups a and c.

notetaking strategy on most units that were analyzed using both the idea unit and story grammar scoring procedures. Recall of idea units (gist), and theme and plot elements was enhanced particularly by these strategies when students read a difficult, less predictable text (i.e., inverted time order). For students who are not proficient readers, the depth of processing needed for a more difficult text could cause additional burdens on reading comprehension. It is probable that the thematic organizer and composing strategies were needed to help students accommodate the text structure (Risko & Alvarez, 1986) and that these strategies are more powerful when they are actually needed by students to comprehend the text.

Second, the thematic organizer and composing strategies we examined have the potential for enhancing students' use of rehearsal strategies. Each strategy provides a shared context for learning—a context in which teachers and students share common, contextual experiences to elaborate upon each others' ideas. The teacher, as a mediator, encourages students' active cognitive processing (Weinstein & Mayer, 1986) by prompting students to clarify and organize story ideas.

Further, these strategies seem to support the hypothesis, advanced by Bransford, Franks, Vye, and Sherwood (1989), Bransford, Sherwood, and Hasselbring (1988) and Bransford, Vye, Kinzer, and Risko (in press) that instruction should provide students with a strategy and information to think about when using that strategy. A strategy alone will not help comprehension unless students can link that strategy to a knowledge base. What students think about during reading is as important as selection of a learning strategy. Providing students with relevant content (i.e., through teacher and student elaborations) while developing a strategy to access and rehearse text ideas can help students understand how contextual information can serve as a tool for making sense of text ideas.

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THE EFFECTS OF REREADING AND RETELLING UPON YOUNG CHILDREN'S READING COMPREHENSION

Patricia S. Koskinen and Linda B. Gambrell
University of Maryland

Barbara Kapinus
Maryland State Department of Education

There is a substantial body of research suggesting repetition and verbal rehearsal play a significant role in learning. With respect to reading comprehension, two related strategies, rereading and retelling, are promising applications of this notion. Rereading, a repetition strategy, has been shown to have positive effects on older students' comprehension and learning (Amlund, Kardash, & Kulhavy, 1986; Todd & Kessler, 1971). Research on retelling, a verbal rehearsal strategy, indicates that providing young children with opportunities to retell what they have read improves memory and recall of text information (Gambrell, Pfeiffer, & Wilson, 1985; Kapinus, Gambrell, & Koskinen, 1987; Rose, Cundick, & Higbee, 1984).

There are two basic theories concerning effects of *repetition* which are relevant to the present study (Annis & Annis, 1987; Mayer, 1983). The quantitative hypothesis suggests repetition will add more information to memory, thereby increasing *how much* is learned. Several studies support the contention that repetition increases how much learners recall (Mayer, 1983; Meyer & McConkie, 1973; Rothkopf, 1968). The qualitative hypothesis suggests repetition allows learners to use a more sophisticated method of encoding based on the conceptual framework of the passage, thereby affecting *what* is learned. The work of Mayer (1983) and Bromage and Mayer (1986) suggests repetition helps learners attend to conceptual principles and information central to content.

Research suggests oral rereading improves word recognition and reading rate (Blum & Koskinen, 1982; Carver & Hoffman, 1981; Gonzales & Elijah, 1975; Samuels, 1979) as well as comprehension (Koskinen & Blum, 1984; O'Shea, Sindelar, & O'Shea, 1985; Taylor, Wade, & Yekovich, 1985). There is, however, limited information on benefits of silent rereading. Surveys with high school and college age respondents indicate rereading text is a preferred study strategy (Anderson, 1980; Kardash, Amlund, & Kulhavy, 1984) and that the read/reread strategy is at least as effective as other study techniques such as notetaking and underlining (Kardash, Amlund, & Kulhavy, 1984; Todd & Kessler, 1971). In addition, a study by Amlund, Kardash, and Kulhavy (1986) found quantity and quality of recall increased when graduate students had the opportunity to reread a passage.

Early research on *verbal rehearsal* by Ebbinghaus in 1885 focused on memory tasks using the paired-associates paradigm (Ebbinghaus, 1964). Recent research has begun to investigate the role of verbal rehearsal in prose learning (Gambrell, Pfeiffer, & Wilson, 1985; Morrow, 1984, 1985, 1986; Rose, Cundick, & Higbee, 1984). Research on retelling as a postreading strategy suggests verbal rehearsal of prose increases immediate and delayed comprehension performance (Gambrell, Pfeiffer, & Wilson, 1985; Kapinus, Gambrell, & Koskinen, 1987). One hypothesis emerging from these studies is that verbal rehearsal results in increased comprehension because it requires readers to organize and reconstruct a personal rendition of text, resulting in greater depth of processing.

This study examined reading comprehension performance of children who (a) read a story once, (b) read a story twice (rereading), and (c) read a story, retold the story, and then reread the story. It was hypothesized that retelling combined with rereading might help young readers monitor comprehension. By retelling a story between a first and second reading, students might become aware of gaps in knowledge and the second reading might become more purposeful and directed.

METHOD

Subjects

Sixty students from fourth-grade classrooms in three Maryland public elementary schools participated. All met the following criteria: a score between the 30th and 70th percentile on the reading comprehension section of the California Achievement Test, a score at or above the 20th percentile on the Cognitive Abilities Test, currently reading at or above the 2^2 level in their reading program, and proficiency in speaking English.

Materials

A 365-word narrative, "Harry and the Terrible Whatzit" (Gackenbach, 1989), from an unfamiliar reading series was selected for clear presence of basic elements of story structure (setting, theme, plot episodes, and resolution). Using the Fry Readability Formula (Fry, 1977) it was determined to be at 2nd grade reading level.

A cued recall assessment, story structure outline, and questionnaire were developed. The recall assessment, based on the story, contained a set of nine text-explicit and nine text-implicit questions. A text-based outline of basic story structure elements was developed to score the retelling task (Thorndyke, 1977); this included information related to setting (time, location, and main characters), theme (initiating event and goal), plot episodes, and resolution/outcomes.

Procedures

Subjects were randomly assigned to one of the three treatment conditions. Researchers met individually with students for two sessions. Session 1 was approximately 25 minutes (depending on condition), and Session 2, taking place 1 week later, approximately 15 minutes.

In Session 1 the researchers established general rapport and provided a meaningful context and purpose for subsequent activities. Students were told they would read a story and then have their retelling taperecorded so younger children who had not yet learned to read could listen to it. Students were asked to read the story silently and to do their best to understand it so they could retell and answer questions after they finished.

Read condition. Subjects in the read condition silently read the story, and then were told they would be the storyteller and have their story taperecorded. They were instructed to take a minute or two to think about how they would tell the story. If the student did not start retelling within the 2-minute period, the researcher asked the student to begin. When the subject finished, the researcher used no more than two general prompts to encourage elaborations.

Read/reread condition. The same procedures used in the read condition were followed for this second condition except for the following modification. After reading subjects were told, "I want you to read the story again so you can be a really good storyteller." Subjects engaged in rereading and rendered a retelling.

Read/retell/reread condition. The same procedures for the read condition were also followed for this third treatment except for the following. Subjects in the read/retell/reread condition read and rendered a retelling. Subjects were told it takes practice to become a good storyteller and they would have an opportunity to read and retell the story again. After rereading, students were told, "Pretend you are telling the story to a new friend who has not heard it before." This new context for retelling was provided to encourage students to repeat ideas they had already mentioned in their first retelling. Students then retold the story a second time.

All retellings in Session 1 were taperecorded for subsequent analysis. Upon completion of the retelling activity, students in each condition orally responded to 18 cued recall questions read by the researcher. Seven days after the first session, subjects met individually with the researcher for Session 2. Each subject was asked to retell the Harry story and answer the orally administered cued recall questions. Retellings from Session 2 were also taperecorded for analysis.

RESULTS

The free recall protocols were transcribed and analyzed for story structure elements delineated in the outline developed from the story. Two raters independently scored 10% of the free recall protocols and cued recall tests. Interrater reliability was 93% for scoring of free recall protocols and 94% for scoring of cued recall tests.

Bartlett's test of sphericity revealed that the dependent measures were correlated ($p<.05$). Analysis of variance procedures were used to determine significant differences between the three treatment conditions with respect to free and cued recall tasks.

Means and standard deviations for immediate and delayed free recall of story structure elements are shown in Table 1. ANOVA procedures revealed statistically significant differences on immediate free recall among treatment conditions for plot, $F(2, 57)=5.91$, $p<.01$, and total story structure, $F(2, 57)=4.76$, $p<.01$. Pairwise

Table 1

Means (and Standard Deviations) for Immediate and Delayed Free Recall of Story Structure Elements

	Read		Reread		Read/Retell/ Reread	
Story Structure Elements	*M*	*SD*	*M*	*SD*	*M*	*SD*
Immediate Free Recall						
Setting	4.20	1.47	4.20	1.40	4.80	.52
Theme	1.00	.92	1.50	.83	1.55	.83
Plot	6.20	4.31	8.70	5.04	10.80	3.14
Resolution	1.05	.83	1.50	.76	1.55	.60
Total	12.45	6.79	16.45	7.96	18.70	4.09
Delayed Free Recall						
Setting	4.15	1.81	4.55	1.19	4.95	.22
Theme	1.25	.91	1.70	.66	1.75	.55
Plot	6.25	3.48	9.10	4.34	10.58	1.96
Resolution	1.05	.83	1.35	.81	1.75	.44
Total	12.70	6.35	16.70	6.41	18.95	2.46

comparisons of treatment means on immediate free recall were made using the Tukey procedure which revealed a statistically significant difference with respect to plot elements between the read group ($M=6.20$) and read/retell/reread group ($M=10.80$). There was also a statistically significant difference with respect to total story structure elements recalled by the read group ($M=12.45$) and read/retell/reread group ($M=18.70$).

ANOVA procedures with delayed free recall data revealed statistically significant differences among the three conditions for plot, $F(2, 57)=8.10$, $p<.01$, resolution $F(2, 57)=4.80$, $p<.01$, and total story structure $F(2, 57)=6.88$, $p<.01$. Pairwise comparisons of treatment means using the Tukey procedure revealed statistically significant differences between the read group and the read/retell/reread group for plot ($M=6.25$, $M=10.58$), resolution ($M=1.05$, $M=1.75$), and total story structure elements recalled ($M=12.70$, $M=18.95$).

Means (and standard deviations) for explicit immediate cued recall questions were as follows: read group = 5.95 (2.21); reread group = 7.35(2.22); read/retell/reread group = 7.75 (1.25). For implicit immediate cued recall these were: read = 6.35 (2.43); reread = 6.95 (1.47); read/retell/reread = 7.60 (1.19). Means (and standard deviations) for explicit delayed cued recall were as follows: read = 5.65 (2.28); reread = 7.10 (2.45); read/retell/reread = 7.75 (.96). For implicit delayed cued recall these were: read = 6.30 (1.98); reread = 7.00 (1.62); read/retell/reread = 7.35 (1.09). ANOVA procedures revealed statistically significant differences among conditions for immediate cued recall responses to explicit questions, $F(2, 57)=4.73$, $p<.01$. Pairwise comparisons of treatment means using the Tukey procedure revealed a statistically significant difference with respect to number of explicit questions answered correctly by the read group ($M=5.95$) and read/retell/reread group ($M=7.75$). The same pattern occurred for delayed cued recall responses. Students in the read group answered significantly fewer explicit questions ($M = 5.65$) than students in the read/retell/reread group ($M = 7.75$).

Analysis of time spent in Session 1 was conducted. Analysis of variance procedures revealed statistically significant differences among groups, $F(2, 57) = 6.72$, $p < .05$. Means were: $M = 20.30$ (read), $M = 23.35$ (read/reread), and $M = 25.60$ (read/retell/reread). Pairwise comparisons using the Tukey procedure revealed statistically significant differences between the read group and the read/retell/reread group.

DISCUSSION

One question addressed in this study was, Do young children benefit from silent rereading as older more experienced readers do, or do they need a strategy to alert them to what they know and do not know about a passage? In this study with younger children there were no differences between the read and the read/reread groups—rereading alone did not result in improved comprehension performance. However, there were significant differences between the read and the read/retell/reread groups. The group that retold the story and then reread the story again outperformed the read group with respect to story structure elements and cued recall. It appears that reading, retelling, and rereading provides students with opportunity to check understanding of the story in the first retelling and then, during the rereading, opportunity to fix misinterpretations or add story features missed in the first reading.

Paris, Lipson, and Wixon (1983) state that a critical component of "reading proficiency, . . . is the ability to detect and repair one's own comprehension difficulties" (p. 300). In addition, these authors indicate that beginning or poor readers lack strategies for detecting and correcting their own comprehension errors. Skilled readers, on the other hand, plan and monitor understanding of text, apply strategies to promote comprehension and learning, assess their success, and revise their approach when comprehension breaks down (Brown, 1984). Combined use of retelling and rereading might provide students with a strategy for assessing and fixing up comprehension of stories. In addition, positive effects of this approach *without* specific instruction suggest there may be even greater potential if students are provided with explicit instruction in the use of rereading and retelling.

There was a significant difference in the amount of time spent in Session 1 between the read group and the read/retell/reread group. Time spent on task is an important variable and may account for the significant differences noted between the read and read/retell/reread groups. Work of Amlund, Kardash, and Kulhavy (1986) and Rothkopf (1968), however, indicates increase in amount of time spent on task and number of exposures to text do not necessarily result in increased recall. It is of educational importance when additional time spent on tasks results in significant increases in learning as was the case in this study.

Since retelling is a natural way of sharing a story, it seemed reasonable to focus this initial research on narratives. However, future research is needed with expository text, a genre usually read to be remembered. Rereading and retelling content material might prove especially effective as a strategy that can be easily understood and used by both content area teachers and their students.

Results of this study suggest that rereading alone does not enhance reading comprehension of younger children. For children in this study, however, combining retelling and rereading did result in increased comprehension.

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THE EFFECTS OF COGNITIVE STRATEGY INSTRUCTION ON ELEMENTARY STUDENTS' READING OUTCOMES

Stephanie L. Knight
Texas A&M University

Recently, several studies have investigated the cognitive strategies students use to obtain meaning from text (i.e, Brown, Campione, & Day, 1981; Cohen, 1983; Hansen, 1981; Hare & Smith, 1982; Padron, Knight, & Waxman, 1986). A cognitive strategy is "a goal-directed sequence of mental operations" (Gagne, 1985, p. 140). When considered in relation to reading, the goal of the mental operations becomes the comprehension of text. Studies have found that good and poor comprehenders of text can be differentiated by their use of these strategies (Garner & Reis, 1981; Golinkoff, 1975–1976; Hansen & Pearson, 1983; Hewitt, 1980). For example, more successful learners use more elaborative strategies (Weinstein, 1978) which serve to incorporate new information into already existing knowledge frameworks. Successful reading strategies of this type include imagery, self-questioning, and paraphrasing or summarizing (Levin & Pressley, 1981). Furthermore, good comprehenders monitor their comprehension more frequently (Weinstein, 1984).

Little is known, however, about the specific teaching behaviors which are associated with the development and successful use of these strategies in the classroom (Norris, 1985). Most of the information on effective teacher behaviors has been accumulated for basic skills achievement by trained observers using low-inference coding instruments (e.g., Brophy, 1979; Brophy & Good, 1986; Medley, 1979). Although these observations have been useful for acquiring certain types of information, they may not provide adequate knowledge about instructional behaviors for developing students' cognitive reading strategies in elementary classrooms. In fact, they have not proven to be very effective in gathering information about teaching and learning strategies for high level thinking which may be embedded in mental events or interaction patterns that are not readily observable (Cohen & Aphek, 1981; Stewner-Manzanares, 1984; O'Malley, Chamot, Stewner-Manzanares, Kupper, & Russo, 1985; O'Malley, Chamot, Stewner-Manzanares, Russo, & Kupper, 1985; Rubin, 1981).

Student responses during interviews or on survey instruments, however, have been found to be realistic and reliable measures of classroom environment, processes, and teacher behaviors which may not be easily detected by use of observation instruments (Fraser, 1986; Gage, 1972; Walberg, 1976). Rosenshine (1971) reports that student ratings are slightly stronger predictors of teacher effectiveness than observer ratings. Several studies also indicate that student perceptions of teacher behaviors significantly predict students' academic achievement (Clark et al., 1976; Eash, Rasher, & Waxman, 1980; Stayrook, Corno, & Winne, 1978; Waxman & Eash, 1983).

Furthermore, the emphasis on internal cognitive processes has resulted in a movement away from total reliance on assessments of overt behavior. Students are viewed as active interpreters or mediators of teacher behaviors instead of passive recipients of informational input (Weinstein & Underwood, 1982; Wittrock, 1974, 1978, 1986). The role of student mediation of instructional behaviors for reading comprehension can be viewed as an important aspect in the goal of enabling students to become independent, proficient readers. In summary, the reliability of student responses coupled with the recent emphasis on research on students' thought processes (Wittrock, 1986) suggest that investigation of student perceptions through interviews or self-report instruments may initially be a more appropriate vehicle than observations for examining the behaviors teachers use to encourage higher order cognitive processing. The relationship between students' perceptions of teaching behaviors in naturalistic settings and student learning needs to be closely examined so that empirically based theories of cognitive reading strategy instruction can be formulated. The objective of the present study is to investigate the relationship between students' perceptions of teachers' instructional behaviors, students' reported cognitive strategy use during reading comprehension activities, and students' achievement on reading outcome measures.

METHOD

Data Sources

The subjects in this study were 141 third-, fourth-, and fifth-grade students from one elementary school located in a large urban school district in the Southwest. The school exemplifies the demographic, socioeconomic, and achievement characteristics typical of elementary schools in central cities as described by Borman and Spring (1984). Students were drawn from a neighborhood consisting primarily of low-income families of Hispanic origin. Although there were several nonEnglish speaking students in these classes, they were not considered to be part of the sample population. Students in the study, however, were largely bilingual and attended ESL (English as a Second Language) classes. Results of basic skills achievement tests place students on or below grade level in reading and mathematics with achievement gains evident over the past 5 years. This achievement pattern mirrors nationwide gains on the Iowa Test of Basic Skills during the 1980s (Borman & Spring, 1984).

The distribution by gender included 79 boys and 62 girls. There were 48 third graders, 44 fourth graders, and 48 fifth graders. The age of the students ranged from 8 to 14 years, with a mean of 10.5.

Instruments

The Reading Strategies Survey (RSS) (Knight, Waxman, & Padron, 1986) was used to obtain information on (a) reading comprehension performance on a specific task, (b) students' reported cognitive reading strategy use, and (c) students' perceptions of the teacher behaviors and classroom processes associated with cognitive strategy use. The composite test score and the reading subscale scores of the Iowa Test of Basic Skills (ITBS) were used as sources of information regarding general student ability as well as specific achievement in reading comprehension. The New Jersey Test of Reasoning Skills (Shipman, 1983) provided information on general higher level thinking (critical thinking) ability and metacognitive ability.

Reading strategies survey. The RSS was developed from data generated by a pilot study which used both think-aloud and structured interviews to investigate students' cognitive strategy use and perceptions of teacher behaviors (Padron, Knight, & Waxman, 1986). Since previous findings indicated that the structured interviews had more predictive validity with student achievement than the think-aloud interviews (Padron, 1985/1986), the structured interviews were used as a basis for development of the survey for the present study. The results of a small group of interviews conducted with students drawn from the present sample population indicated no significant differences between student responses on the interviews and the surveys (Knight, 1987/1988).

The first part of the RSS contains a passage from the Ekwall Reading Inventory (Ekwall, 1979) which students first read silently. Following the passage are questions which exemplify three levels of questions: text explicit (TEQ), text implicit (TIQ), and script implicit (SIQ) (Pearson & Johnson, 1978). These three categories form a questioning taxonomy which demonstrates the relationship between the question, the prior knowledge of the reader, and the organization of the text. Each answer was scored and weighted according to its taxonomic level and added to form a Total Reading Task Score which provided an assessment of students' performance on higher level tasks in reading comprehension.

A measure of students' confidence in their answers was also included. Adapting a system used by Forrest-Pressley and Waller (1984), students were assigned a score which corresponded to the match between their confidence in their answers and the accuracy of their responses to the series of questions. This system serves as an index of the variable Comprehension Monitoring which is based on the student's accuracy in predicting success on each question.

The second part of the RSS contains questions about the use of 13 specific cognitive reading strategies identified by previous research and theoretical literature (Padron, Knight, & Waxman, 1986). Students indicated the extent to which they engaged in the use of a strategy by responding to a Likert-type scale ranging from Always to Never. The 13 cognitive reading strategies can be subdivided into two groups and designated as either "weak" or "strong" in relation to achievement in reading comprehension according to the results of previous research. (Lists of strong and weak strategies are included in Table 1.)

The third part of the survey investigates students' perceptions of the teaching behaviors related to the 13 cognitive reading strategies previously described. More specifically, students were asked to indicate the existence and extent of specific instruction in these 13 strategies by their reading teacher. As with the student strategies, the teacher behaviors indicating specific instruction in the student strategies were subdivided into "Weak" and "Strong" scales which correspond to the weak and strong cognitive reading strategies identified previously.

The RSS also examined students' perceptions of classroom processes identified

Table 1

Means, Standard Deviations, and Range of Students' Perceptions of Cognitive Reading Strategies

Student Strategies	*M*	*SD*	Range	Rank
Strong Student Strategies	2.51	.52	1.4–3.8	
Predicting Outcomes	2.74	.90	1.0–4.0	4
Imaging	2.73	.90	1.0–4.0	5
Self-Generated Questions	2.57	.87	1.0–4.0	6
Summarizing	2.36	.92	1.0–4.0	7
Assimilating to Personal Experience	2.16	.90	1.0–4.0	12
Weak Student Strategies	2.49	.39	1.6–3.5	
Changing Speed	3.24	.78	2.0–4.0	1
Concentrating	3.17	.80	1.0–4.0	2
Rereading	2.80	.84	1.0–4.0	3
Searching for Salient Details	2.33	.86	1.0–4.0	8
Seeking Help from Peers	2.25	.93	1.0–4.0	9
Selective Reading Due to Difficulty	2.22	1.04	1.0–4.0	10
Selective Reading Due to Interest	2.21	.93	1.0–4.0	11
Rapid Reading	1.70	.92	1.0–4.0	13

through examination of the teacher effectiveness research (see e.g., Brophy & Good, 1986; Rosenshine & Stevens, 1986). (A list of these processes is included in Table 2.)

The results of a reliability analysis reveal that the internal consistency of the RSS is .80. The reliability of the three sections of the survey previously described (Student Strategies, Teacher Behaviors, and Classroom Processes) is somewhat less due to the decreased number of items used in the analyses of these sections and the diversity of the questions. The alpha coefficients for these sections are .66, .67, and .59 respectively.

Procedures

Students were administered the Reading Strategies Survey (RSS) in small groups of 4 to 6 students which were randomly selected from the class rosters of third-, fourth-, and fifth-grade classrooms. As previously described, students read a passage from the Ekwall Reading Inventory (Ekwall, 1979) matched to their independent reading level and then responded to a series of questions about strategy use and related teacher behaviors. The survey administrator read the questions aloud to the group as individuals read them silently so that reading or language proficiency would not interfere with the students' ability to respond to the questions.

Descriptive statistics (means, standard deviations, and correlations) were used for analyzing students' strategy use and their perceptions of teachers' behavior. Canonical correlation analysis was used to determine the maximum correlation possible between students' strategies and students' cognitive achievement and between teachers' behaviors and students' cognitive achievement.

Table 2

Means, Standard Deviations, and Range of Students' Perceptions of Teacher Behaviors

Teacher Behaviors	*M*	*SD*	Range	Tank
Specific Instruction in Strategies				
Strong Student Strategies	2.26	.54	1.0–3.6	
Predicting Outcomes	2.47	.90	1.0–4.0	4
Self-Generated Questions	2.40	1.00	1.0–4.0	5
Imaging	2.33	.93	1.0–4.0	6
Summarizing	2.19	.92	1.0–4.0	8
Assimilating to Personal Experience	1.93	.86	1.0–4.0	12
Weak Student Strategies	2.31	.39	1.4–3.5	
Changing Speed	3.20	.90	1.0–4.0	1
Concentrating	3.06	.88	1.0–4.0	2
Rereading	2.75	.96	1.0–4.0	3
Searching for Salient Details	2.21	.87	1.0–4.0	7
Selective Reading Due to Difficulty	2.01	.96	1.0–4.0	9
Seeking Help from Peers	1.95	.90	1.0–4.0	10
Selective Reading Due to Interest	1.94	1.03	1.0–4.0	11
Rapid Reading	1.32	.65	1.0–4.0	13
Generic Teacher Behaviors				
Delivery of Instruction	2.89	.34	1.9–3.6	
Instructional pacing	2.94	.44	1.8–3.8	3
Feedback	3.08	.70	1.5–4.0	2
Modelling	3.37	.81	1.0–4.0	1
Instructional Materials	2.15	.57	1.0–3.5	7
Classroom Organization	2.39	.58	1.0–3.8	
Peer Cooperation	2.15	.74	1.0–4.0	7
Grouping Arrangements	2.63	.90	1.0–4.0	4
Emphasis on Problem-Solving	2.24	.34	1.7–3.1	
Emphasis on Process	2.62	.72	1.0–4.0	5
Tolerance for Divergent Solutions	1.69	.60	1.0–3.5	9
Opportunity for Problem Solving	2.41	.61	1.0–4.0	6

RESULTS AND DISCUSSION

Students' Perceptions of Strategy Use

Table 1 presents the means and standard deviations of students' perceptions of their cognitive reading strategies. Students reported using 6 of the 13 strategies most of the time. In general, students reported using weak strategies as much as strong strategies. In particular, the three most frequently cited strategies were all from the weak category: Changing Speed, Concentrating, and Rereading. Since the use of the set of weak categories correlated negatively with two of the reading achievement measures used in the study (see Table 3), Reading Comprehension and Total Language Composite, the students do not appear to be using effective strategies for reading comprehension.

Students' Perceptions of Teacher Behaviors

Table 2 presents the means and standard deviations of students' perceptions of teacher behaviors and classroom processes. Results of the analyses of specific instruction in reading strategies were very similar to those produced by the analyses of the types of strategies used by students. Students reported specific instruction in as many weak strategies as strong strategies. Likewise, they reported teacher instruction in the weak strategies of Changing Speed, Concentrating, and Rereading most frequently. Based on this outcome, students appear to be responding to what they perceive teachers are telling them to do in relation to strategy use during reading comprehension. Students, however, reported that their teachers showed or told them how to use only 3 of the 13 strategies most of the time and that they received infrequent instruction in the remainder. None of the strong strategies was perceived being taught frequently. Therefore, students report using more strategies than they report receiving through specific instruction.

Students' perceptions of Generic Teacher Behaviors revealed that students perceived their teachers engaging most of the time in the following three behaviors: (a) Modelling, (b) Feedback, and (c) Pacing. Although small group instruction was used most of the time, little teacher-encouraged Peer Cooperation was perceived. Furthermore, teachers were not often perceived as being tolerant of divergent responses or comprehension processes. Process was emphasized, but students perceived that they must conform to teacher-defined "correct" processes.

Students' Strategies and Cognitive Achievement

The relationship between achievement and student strategy use and instructional behaviors was investigated using two canonical correlation analyses: (a) the set of student strategies with the set of student cognitive and metacognitive achievement

Table 3

Intercorrelation Matrix for Students' Cognitive Achievement and Strong and Weak Strategy Instruction Scales

Variables	1	2	3	4	5	6	7	8
1. Reading Comprehension	1.00	.73***	.40***	−.12	.21*	−.07	−.07	−.24*
2. Total Language Composite		1.00	.21*	.25*	.24*	−.13	.13	−.20*
3. Reading Task			1.00	−.05	.12	.07	.04	−.12
4. Comprehension Monitoring				1.00	.02	−.02	.22**	.02
5. Critical Thinking					1.00	.49***	−.12	.00
6. Prediction Accuracy						1.00	−.18	−.16
7. Strong Strategies Scale							1.00	.40***
8. Weak Strategies Scale								1.00

*$p < .05$. **$p < .01$. ***$p < .001$.

indicators, and (b) the set of student perceptions of specific instruction and generic teacher behaviors with the set of student cognitive and metacognitive achievement indicators. The second analysis, however, did not reveal any significant relationships between the set of teacher behaviors and students' achievement.

Table 4 reveals that the canonical correlation analysis of the set of student reading strategies with the set of achievement indicators produced one significant canonical correlation coefficient with a magnitude of .59 ($p<.05$). The significant canonical variate received its heaviest contribution from the student strategy of (a) Imaging (positive relationship) and, to a lesser extent, the strategies of (b) Changing Speed (positive relationship), and (c) Self-Generated Questions (negative relationship), (d) Predicting Outcomes (negative relationship), and (e) Rereading (negative relationship). The achievement measures which contributed most to the variate included the Reading Task and, to a lesser extent, the Comprehension Monitoring score.

In other words, student use of Imaging and Changing Speed, and avoidance of Rereading, Self-questioning, and Predicting Outcomes were related to student success on the Reading Task and to students' Comprehension Monitoring ability. This outcome

Table 4

Standardized Canonical Correlations for Students' Reading Strategies and Cognitive Achievement

	Canonical Variate I
Student Strategies	
Rereading	−.34
Selective Reading Due to Interest	.13
Imaging	.85
Changing Speed	.31
Concentrating	.16
Searching for Salient Details	−.08
Summarizing	.08
Self-Generated Questions	−.37
Selective Reading Due to Difficulty	.15
Rapid Reading	−.28
Predicting Outcomes	−.40
Assimilating to Personal Experiences	.24
Seeking Help from Peers	.13
Cognitive Achievement Measures	
Critical Thinking	−.29
Prediction of Accuracy	−.26
Reading Task	.74
Comprehension Monitoring	.40
Reading Comprehension	.14
Total Language Composite	.22
Canonical *r**	.59

*$p<.05$.

suggests that the use of certain strategies may be task specific. Furthermore, it appears that the characteristics of the problem (the text) may be interacting with the characteristics of the problem solver (the text processor) to influence strategy use and achievement (Levin & Pressley, 1981). In this situation, the use of Changing Speed may be related to the language and cultural backgrounds of the participants in the study. Language difficulties experienced by the largely bilingual, Hispanic subjects may result in the necessity to read slower or more carefully since decoding difficulties interfere with effective strategy use (Golinkoff, 1975–1976; Kavale & Schreiner, 1979; Rosner, 1979). The finding that the verbal elaboration strategies of Predicting Outcomes and Self-Generated Questions were not used when the imaging strategy was used, and were not associated with student success on the task, may be related to the language proficiency of the students as well as the nature of the reading passages. Furthermore, culturally unfamiliar material (in this case, a passage about camping) may produce additional difficulties, making the task of assimilating the text to personal experience almost insurmountable (Hewitt, 1980) without a strategy like Changing Speed which insures adequate processing time.

IMPLICATIONS FOR THEORY AND PRACTICE

Findings of the current study revealed that few strong cognitive reading strategies, as indentified by previous research and theoretical literature, were related to elementary ESL students' achievement. These results are consistent with the theory that mere possession of strategy knowledge does not necessarily guarantee the effective use of strategies, since the extent of prior knowledge may actually determine effectiveness (Peterson & Swing, 1983).

Furthermore, student strategies in this study were related to achievement measures only when combined with other strategies. For this reason, the categories of Strong and Weak may not actually be appropriate for characterization of individual strategy use. Combinations of strategies may actually determine effectiveness. Individual strategies would then exhibit different relationships with achievement depending on the conditions of their use and the other strategies with which they are combined. In the present study, for example, Imaging (classified as a strong strategy) and Changing Speed (classified as a weak strategy) emerged as successful for the Reading Task and Comprehension Monitoring score. The use of an imaging strategy (Imaging), paired with a strategy which would enable the time-consuming process of retrieval of prior knowledge from memory to occur (Changing Speed) (Gagne, 1985), resulted in more successful performance in reading comprehension for the population of students studied.

Findings of the current study also indicate that ESL students do not perceive a great deal of instruction in the use of strong cognitive strategies for reading. Given the lack of attention to higher level processes such as reading comprehension in either student textbooks or teacher education preparatory texts (Durkin, 1981, 1986), this outcome is not surprising. Furthermore, students' perceptions of specific instruction in strategies do not exhibit a direct relationship with student achievement in reading. Although interference between existing strategies and those introduced by instruction has been suggested as an explanation for the mixed findings on strategy instruction

(Holley & Dansereau, 1984; Winne & Marx, 1980), perhaps the conclusion to be drawn is that merely instructing students to adopt a strategy does not insure its effective use (Levin & Pressley, 1981). Teachers may function as catalysts for student behaviors which are ultimately linked with achievement (Winne & Marx, 1982). The finding of no significant canonical correlation coefficient for the set of teacher strategy instruction behaviors with student reading achievement would support this conclusion.

Results of the present study also indicate that although students frequently observe the behaviors (e.g., Modelling, Feedback, and Pacing) identified by previous teacher effectiveness research (i.e., Brophy & Good, 1986; Rosenshine & Stevens, 1986), student perceptions of Generic Teacher Behaviors have little direct relationship with student outcomes. Although the role of the teacher may be important in the acquisition and use of cognitive strategies, it is possible that "what the student does is actually more important in determining learning than what the teacher does" (Shuell, 1986, p. 429). As with the behaviors associated with Specific Instruction, students mediate the effects of teacher behaviors (Wittrock, 1986), often with results other than those initially intended by the teacher (Weinstein, 1983).

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LANGUAGE AS A RESOURCE FOR MEDIATING COMPREHENSION[1]

Elba I. Reyes, Grace Z. Duran, and Candace S. Bos
University of Arizona

One of the most important features of language is that it regulates thought development and expression (Frauenglass & Diaz, 1985; Luria, 1961; Vygotsky, 1937/1987; Zivin, 1979). This premise is grounded on the Vygotskian perspective of language mediation and the connection between thought and spoken word. Accordingly, thought is influenced by language which helps mediate the expression of thought: a dialectic process. Within this theoretical framework, language mediation refers to the deliberate action of the individual to modify language behavior within the social context of the communication process. The individual responds to, affects, and changes the communication interaction. Through the mediation process the individual uses words to express meaning. Language use is especially important when considering the role of language in learning (Cummins, 1984; Moll, 1988) and the social, interactive process of reading (Anderson, 1984; Diaz, Moll, & Mehan, 1986). Opportunities to mediate the language of the classroom are critical for students learning a second language as they attempt to construct meaning during communication.

Substantial effort has been directed by researchers toward cognitive consequences of using more than one language to communicate (Wong-Fillmore & Valadez, 1986). Historically, studies investigating the effects of bilingualism on cognitive development have suggested that bilingual individuals are intellectually disadvantaged. Conclusions were based on findings derived from quantitative data (e.g., tests of new immigrants to the U.S.). Deviations from standard English and language mixing became markers of retardation in language development, and code switching was identified as a language problem to be suppressed and eliminated (Smith, 1939; Weinreich, 1953). These studies have been criticized for an array of flaws in methodological design and procedures (Darcy, 1963; Pintner, 1932; Saer, 1924). Nonetheless, the conclusions from these early data permeated research directions and political action for over 5 decades.

In 1962, the landmark study of Peal and Lambert in Canada stirred new interest in research when results indicated that bilingual children had a language asset: they were more facile at concept formation. Peal and Lambert (1962) suggested that this asset was related to bilingual children's ability to alternate languages or codes. Subsequent researchers suggested that bilingual children are able to perceive the arbitrary nature of

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language earlier than monolingual children (Ianco-Worrall, 1972), do better on Piagetian tasks of conservation (Liedtke & Nelson, 1968), pay more attention to structure and details on verbal tasks (Ben-Zeev, 1977), and appear to employ alternative learning strategies (Duncan & De Avila, 1979). Bilingual individuals' abilities to use and mediate language seem to influence cognitive development.

One language behavior particular to bilingual speakers is language alternation or code switching. Code switching can be defined as the intentional alternation between language systems, or codes, incorporating components of each system during communication (Reyes, 1988). This phenomenon has been studied by social linguists who have looked at language influence (Flores, 1982) and at the social context in which switching occurrs (Auer, 1984; Fishman, 1975; Gumperz, 1972), psycholinguists interested in the mental functions performed during the switching process (Ben-Zeev, 1977; MacNamara, Krauthammer, & Bolgar, 1968), and linguists who have examined the grammatical functions of code switching and rules governing the process (McClure, 1981; Pfaff, 1982; Poplack, 1982).

More recently, Hakuta (1986) focused on bilingual children's metalinguistic abilities when reading and listening to sentences that contained code switching. Results demonstrated that children's ability to perform on the metalinguistic tasks was not confounded by the code switching portion of the sentence. Further, children identified code switched portions that did not follow acceptable norms of code switching as grammatically unacceptable. Diaz, Moll, and Mehan (1986) used a Vygotskian perspective to increase the reading performance of bilingual children. In this study, children were encouraged to use all their language resources including code switching. Through this research, Diaz and his colleagues have demonstrated that it is possible to capitalize on children's linguistic strengths to enhance both teaching and learning.

The question of whether code switching negatively affects cognitive development has traditionally been answered based on inconclusive findings and on the particular political stance of the respondent (Reyes, 1988). Recent researchers have addressed issues related to bilingualism and cognitive development. This study contributes to that literature by reporting on an investigation of the influence of code switching on cognition and, more specifically, on vocabulary acquisition and reading comprehension during classroom instruction.

This study emerged while we were studying the effectiveness of different vocabulary strategies with bilingual learning disabled students. During instruction, we observed that some students appeared to use both languages to mediate and express their thoughts whereas others did not. Students were subsequently assigned to groups according to their use of code switching to determine whether code switching was detrimental to vocabulary acquisition and reading comprehension.

METHOD

Subjects

Subjects were 34 bilingual upper elementary students with learning and reading disabilities. They were identified based on school district criteria including a discrepancy between intellectual functioning (Performance IQ, $M=94.50$, $SD=13.03$) as measured by the *Wechsler Intelligence Scale for Children—Revised* (Wechsler, 1974) and reading achievement standard score ($M=76.71$, $SD=7.51$) as measured on the *Woodcock-Johnson Psychoeducational Battery*, (Woodcock & Johnson, 1977). For these students, Spanish was their first language and some degree of Spanish was currently spoken in the home. The students were part of a larger study which investigated the effectiveness of four vocabulary instructional strategies on vocabulary acquisition and reading comprehension. Students in the larger study were grouped according to language of instruction and then assigned to vocabulary strategy groups. Students in the subsample were assigned post hoc to one of three language conditions (Spanish, English, or Spanish/English). Students were assigned to the Spanish/English condition if they evidenced any use of code switching. The number of students receiving the different instructional strategies was counterbalanced across the three language conditions.

Information concerning the students' language proficiency was obtained through either the school administered *Language Assessment Scales* (Duncan & De Avila, 1983) or the *Language Proficiency Measure* (Tucson Unified School District, 1982). As would be expected, differences were evident among the three groups in relation to Spanish language proficiency, $F(2, 31),=6.26$, $p<.05$, and English language proficiency $F(2, 31)=4.37$, $p<.05$. Post hoc analyses using the Newman-Kuels method (Glass & Hopkins, 1984) indicated students in the Spanish and Spanish/English conditions had significantly higher Spanish language proficiency and lower English proficiency than students in the English condition (see Table 1).

Materials

Both instructional and assessment materials were developed in Spanish and English.

Instructional materials. For the vocabulary instruction, three chapters were selected from a third-grade social studies book published in both English and Spanish (Hirsch & Bacon, 1988). Each chapter was analyzed using a content analysis (Frayer, Frederick, & Klausmeier, 1969) to identify key concepts and their relationships. One chapter served as a staff development passage, a second as a practice passage, and a third chapter on community services served as the experimental passage. The concepts

Table 1

Means and Standard Deviations for Language Proficiency Ratings ($n=34$)

	Spanish ($n=12$)	English ($n=10$)	English/Spanish ($n=12$)
Spanish Proficiency[a]	2.75	1.80	2.67
	(.62)	(.79)	(.65)
English Proficiency[a]	2.08	2.90	2.25
	(.79)	(.32)	(.75)

[a] Based on the following 3-point scale: 1 = Nonfunctional; 2 = Functional; 3 = Proficient.

(content-related vocabulary) generated from the content analysis and their context-grounded definitions served as the focus of instruction.

Assessment materials. To measure vocabulary acquisition and reading comprehension, a 32-item multiple-choice test for the experimental passage was developed. Test construction was based on the content analysis with the test consisting of 15 vocabulary items and 17 comprehension items. This test also served as a topic-specific prior knowledge pretest.

Procedures

The students were taught by their teachers using the vocabulary instructional strategies. To prepare these special education teachers, systematic staff development was provided over a 6-week period. This consisted of presentations with discussions, cognitive and procedural modeling, practice using the materials, and feedback and reflection.

Prior to intervention, students were given the pretest. One week later the teachers and students practiced using the vocabulary strategies with the staff development chapter and instructional materials. Two weeks later, students participated in three 50-minute practice sessions using the practice chapter and materials. Approximately 2 weeks after this, they participated in three 50-minute experimental sessions.

During the first practice and experimental sessions, students participated in one of four prereading activities designed to enhance reading comprehension. These activities were semantic mapping (Pearson & Johnson, 1978), semantic feature analysis (Bos & Anders, 1987), semantic/syntactic feature analysis (Allen, 1985), or definitional instruction (Bos, Allen, & Scanlon, 1988). Both the practice and experimental sessions were video- and audiotaped.

On the second day of intervention, the students reviewed the instructional materials and read to confirm their predictions or learning. Following reading, students discussed the instructional materials and clarified questions. On the third day of intervention, students again reviewed the materials and then completed the multiple-choice test.

During instruction, the teachers used the students' most proficient language. Teachers were encouraged to use the students' other language as support. Students read the passage and took the multiple-choice test in the language in which their reading was more proficient.

RESULTS

In this study it was hypothesized that students who code switched between L1 and L2 during instruction would score no differently on the vocabulary acquisition and reading comprehension measures than students who did not evidence code switching. One-way analyses of covariance were conducted for the vocabulary and comprehension items on the multiple-choice test. The scores on the pretest, the Performance Scale IQ, and English and Spanish proficiency ratings served as the covariates in the analyses. Results on the analyses of covariance for the vocabulary items, $F(2, 27) = .05$, and the comprehension items, $F(2, 27) = .30$, indicated no significant differences among

Table 2

Adjusted Means and Standard Deviations for Vocabulary and Comprehension Scores (n = 34)

	Spanish ($n = 12$)	English ($n = 10$)	Spanish/English ($n = 12$)
Vocabulary	9.32	9.57	10.13
	(2.1)	(2.6)	(2.0)
Comprehension	8.93	8.80	9.24
	(1.7)	(3.5)	(1.8)

the three language condition (see Table 2). The covariates did not significantly influence either the vocabulary items, $F(4, 27) = 1.11$ or the comprehension items, $F(4, 27) = 1.18$.

DISCUSSION

A concern facing teachers of bilingual students is the role of two languages during instruction. Code switching is still a widely discussed issue (Wong-Fillmore & Valadez, 1986) that has been tainted by early methodologically flawed studies. Those studies suggested that code switching was detrimental to learning. The challenge to explore the validity of such a position becomes critical when we consider the increasing number of language minority students entering our school systems each year, and the need for developing effective programs. Therefore, the purpose of this study was to determine if code switching is detrimental to learning as measured by vocabulary acquisition and reading comprehension.

Results of this study lend support to the contrary. Overall, the Spanish, English, and Spanish/English groups performed similarly on both vocabulary acquisition and comprehension measures. These results add to the growing body of current research that refutes the early notions of bilingualism and code switching. Furthermore, they uniquely contribute to this literature in that they provide evidence within the context of classroom instruction using measures of learning. The findings also highlight the importance of permitting students to use either language as a resource during instruction. As demonstrated in the following example one student helped clarify the concept of *propiedad privada* (private property) by using both Spanish and English:

> S. La casa de nosotros si nadie quiere que entre es private property. (If nobody wants anybody to enter our house, that's private property.)

Use of both languages was also evident across the teacher and the students within the same instructional setting as evidenced in the following dialogue:

> T. Que quiere decir *publico*? (What does public mean?)
> S_1 . . . like working for the *publico*, like working for the police and fire . . .
> S_2 *y ambulancias y policia* (and ambulances and police).

These observations complement the findings by Diaz, Moll and Mehan (1986) that encouraging students to respond in either language provides them with expressive facility thus demonstrating their actual level of comprehension.

Code switching in the classroom is an important instructional variable which requires further analysis and study. Relationships between the amount and types of code switching used by the teacher and students need to be addressed. Teachers' use of code switching appears to have influenced the students' use of code switching. During the observations of the videotaped instructional sessions, we noted that code switching occurred in classrooms where the teacher code switched or encouraged code switching. Similarly, the effect language use has on students who do not code switch, but who are enveloped in the code switching environment should also be studied. Regarding design, a future study might assign students who code switch to instructional conditions in which the teacher does or does not code switch. Such a study would alleviate the limitations of post hoc assignment to language condition.

Language, as referred to by Vygotsky, is a cultural tool for mediating interactions and meaning (Moll, 1988). Code switching, a language behavior, is a cultural tool used by the bilingual child in mediating comprehension, a primary objective of instruction.

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UNIVERSAL AND CULTURE-SPECIFIC ASPECTS OF HMONG FOLK LITERATURE

Timothy G. Morrison
California State University, Fresno

Reading is a complex, interactive process that requires readers to use a variety of information sources simultaneously to construct meaning from print. Among the knowledge sources needed by readers to comprehend written text are syntactic and semantic knowledge, knowledge of sound/symbol relationships, knowledge of text structure, and cultural schemata. Of particular interest in this study were the two latter knowledge sources.

Stein and Glenn (1979) indicate that children acquire a concept of story at a very young age, due in part to repeated exposure to many stories. Children begin to expect certain structures and conventions when they hear stories, and they learn to recognize stories that are and are not well formed. Many people agree that knowledge of story structure in one's own culture plays a facilitative role in reading comprehension (Langer & Smith-Burke, 1982; Spiro, Bruce, & Brewer, 1980; Steffensen, Joag-dev & Anderson, 1979). However, questions arise concerning the effects of story structure on comprehension when text written in a second language and representing a different culture is read. If story structure varies from culture to culture, then reading comprehension in a second language may be impaired or prevented if the reader is unaware of the structure of the text he or she is reading.

Asher (1978) reports that little is now known, but much more should be known, about universal and culture-specific aspects of stories. Brewer (1984) suggests that most stories from around the world contain both universal and culture-specific features. Kintsch and Greene (1978) agree that stories from different cultures include elements that are specific to those cultures. On the other hand, Mandler, Scribner, Cole and DeForest (1980) disagree. They argue that stories across cultures contain the same essential story parts; they are much more similar in structure than different. Analyses of Japanese stories, however, reveal some features that appear to be unique to that culture (Matsuyama, 1983). For example, main characters in Japanese stories rarely engage in goal-directed activities, unlike main characters in American stories. Barnitz (1986) suggests that "more research is needed to explain the roles of story structure" (p. 111), especially culture-specific and universal aspects of story.

The purpose of this investigation was to explore the universal and culture-specific aspects of the folk literature of the Hmong, an ethnic group originally from southern China. In the late 18th and early 19th centuries, some of the 5 million Hmong in China migrated to Laos, Vietnam, and Thailand. In the last decade, approximately 85,000

Hmong have come to the United States and, of that number, over one fourth have settled in the Fresno, California area. The over 22,000 Hmong people presently living in the Fresno area represent the largest concentration of Hmong anywhere outside Southeast Asia.

The Hmong come from a traditionally oral culture. They had no written language until the 1950s when French and American missionaries developed a Romanized alphabet for the Hmong language. Because of the relatively sudden influx of the Hmong to the Fresno area and because of unique features of their culture, a number of social, economic, and educational concerns have surfaced. Among the issues of concern are those dealing with language and literacy. Recognizing that the success of a group's ability to merge into a new society is related in part to language ability, this study aimed to make progress toward helping the Hmong become successful users of the English language. Specifically, it was thought that if we could become aware of culture-specific and universal aspects of Hmong folk literature, we could begin making some positive decisions regarding reading instruction for the Hmong.

DESIGN OF THE STUDY

To assist in determining the universal nature of Hmong folk literature a common story grammar was used to capture the essential elements of the stories. Thorndyke's (1977) story grammar was chosen for the analyses due to its widespread use. This story grammar consists of elements commonly found in stories: Setting (including Characters, Location and Time), Theme (Goal), Episodes (Attempts and Outcomes), and Resolution. Stories from Western folk tradition fit this story grammar nicely and it was thought that, if the Hmong stories also fit it, we could learn something about the universality of those stories.

Brewer (1984) offers suggestions regarding how to distinguish culture-specific from universal story features. Implicit in his argument is the assumption that stories from all cultures have the possibility of containing what he calls "the basic story elements": Opening, Setting, Characters, Events, Resolution, Epilogue, Closing, and Narrator. This assumption seems to be founded on the work of researchers such as Applebee (1978), Stein and Glenn (1978), and Thorndyke (1977).

Brewer (1984) further suggests that the universal narrative elements he named (Opening, Setting, Characters, etc.) can be realized in a variety of ways in different cultures' stories. The options possible in stories include the presence or absence of an element, the explicitness of an element, and the order in which the elements may occur (initial introduction of elements, repetition of elements, and the degree to which story events match actual event order).

Twenty-six Hmong stories from a collection by Johnson (1985) were included for analysis in this study. All the stories were analyzed using both the Thorndyke and the Brewer analyses. The stories, told in Hmong by elders shortly after their arrival in the United States, were translated first into French and then into English. The translations were checked with the storytellers to assure accuracy in translation. The 26 stories are not by any means an exhaustive list of Hmong stories. Rather, they represent the types of stories common in Hmong culture.

The stories were analyzed using the Thorndyke (1977) story grammar to determine whether they included story elements generally considered to be universal. Two judges read a sample of the stories independently to be sure their analyses were similar to one another. The judges reached approximately 85% agreement regarding the mapping of the stories, and differences were resolved, resulting in 100% agreement. Following the initial period of applying the Thorndyke model to the Hmong stories, the researcher analyzed the remaining stories.

After this initial analysis, the judges considered Brewer's (1984) matrix to identify patterns in the Hmong stories that could be unique to that culture. Following independent assessment by the judges and considerable discussion, it was determined that the Brewer matrix could be used consistently by the researcher to analyze the Hmong stories in the sample. The analyses described above led to the following results.

RESULTS

The stories included in the study were typical Hmong folk stories. Among the 26 stories were 6 that described and/or explained origins. "The Beginning of the World," "The Flood and Hmong Clan Names" and "Why Some People are Left-Handed and Some are Right-Handed" are examples of origin stories in the sample. Because these were not typical folk stories, but rather myths, they were not easily mapped using the two instruments, just as many myths from other cultures could not be mapped well using the instruments. As a result, the origin stories were not included in the findings based on the Thorndyke analysis. The remaining 20 stories were more "story-like," and are included. All 26 stories were included in the Brewer analysis.

Common Characters

Except for some of the myths, the stories were driven by the actions of main and minor characters. The characters were generally introduced early in the stories and for the most part carried the action throughout the plot. In some cases, where more than one story was included in a larger story, some or all of the characters "disappeared" during the "first" story and were replaced by a set of new characters for the second part of the larger story.

Some characters appeared in more than one of the stories. For example, Shao, a wise, benevolent man, appeared in several of the stories to provide help and advice to one of the other characters. Pa La See also appeared in two of the stories to provide instruction for some of the other characters in the use of magic to fight evil.

In addition to specific characters who appeared occasionally in the collection of stories, there were also types of characters who appeared. For example, many of the stories included an orphan boy as a main character. Animals, such as tigers, pigs, elephants, water buffalos, bulls, and chickens also appeared often in the stories. A king was frequently found in the stories as a powerful force for either good or evil. Spirits (both good and evil, and spirits of ancestors) were found in nearly all the stories.

Time-Ordered Sequence of Events

The stories in the Hmong collection followed the Thorndyke story grammar in that they generally followed a natural time-ordered sequence. Story events usually occurred in the same order they could be expected to occur in real life. The reason for this may be that the stories have an oral heritage. Storytellers frequently need to remind listeners of the sequence of events. As a result, time-ordered sequence markers, such as long ago, the next day, at that time, and 3 years later, were very common in all the stories.

Despite this widespread adherence to the Thorndyke story grammar, an interesting structure surfaced. Four of the stories included more than one story within their boundaries. For example, in "Shee Yee and the Evil Spirits that Ate People and Drank Blood," there are two stories, complete with different sets of characters. The first story sets the stage for the second and the second story makes reference to the first. They are distinct stories, but they were told as one story.

Types and Frequency of Goals

Matsuyama (1983) reported that characters in Japanese folk tales generally do not engage in goal-directed behavior. In contrast, the actions of the main characters in the Hmong stories were usually goal-directed. In general, the actions of the characters sought to achieve one or more of the following three goals: (a) to live a comfortable, pleasant life; (b) to find a good wife; and (c) to acquire wealth and/or power.

The main characters in the Hmong stories frequently achieved these goals. The stories generally had happy endings, where the problems were resolved and good overcame evil.

Conventionalized Beginnings

A common pattern that occurs in stories across cultures is the presence of conventional beginnings, a typical way to signal that the story is beginning. For example, in Western folk and fairy tales it is common for the stories to begin, "Once upon a time . . ." This practice of having conventional beginnings is especially true for stories coming from an oral tradition. Among the Hmong stories included in this analysis, there were three beginnings, listed in descending order of frequency, that appeared often:

1. "Long ago . . ."
2. "There was once . . ."
3. "Soon after . . . (the last event in another story)"

As is common in stories from a rich oral heritage, these Hmong stories usually took place in the distant past, suggesting that the stories concern themselves with events, people, places, and so forth, in the past of that culture.

Conventionalized Endings

Just as stories begin in predictable ways, they frequently end in ways that are common. Stories from an oral tradition often have conventional endings, reflecting the need for storytellers to signal that the story is over. Again, Western folk and fairy stories (that also come originally from an oral tradition) frequently end with, "And they lived happily ever after."

The Hmong stories analyzed also had common endings. "And that's how the story ends'' signalled the end for 15 of the stories. Ten of the stories ended with a short, simple statement explaining that the main character lived a comfortable life or was well-off. Two of the stories included a stated moral at the end and one ended with, ''And they lived happily ever after.'' The endings usually indicated that the goal of the main character had been achieved and that goodness had triumphed over evil.

Occurrence of Numbers

A common element in the stories was the use of numbers to describe events, attempts, or groups of people or things. The same numbers were used repeatedly to describe these events, attempts, or groups. The numbers 3, 7, and 12 were used particularly often. Examples of the use of numbers are, ''3 years passed,'' a king had 7 wives, and there were 12 jars of gold and silver. It is interesting to note that the same numbers (3, 7, and 12) are used frequently in Western stories and culture.

Irony in the Stories

In many of the stories the plot takes an ironic twist when there is an incongruity between what occurs in the story and what might be expected to happen. In these ironic occurrences Hmong culture is revealed. For example, in Hmong culture women frequently play a subservient role to men. However, in some of the stories women bring wealth and power to men. In ''The Woodcutter, His Rooster and His Wife,'' the main character, a man, chastises and even physically abuses his wife for killing his prize rooster to feed the king. However, that she did kill the rooster led the king to appoint the man chief of his village. Another ironic theme in some of the stories is that something that appears to be of value can turn out to be disappointing. For example, in ''The Legend of Nia Ngua Zhua Pa,'' the beautiful, young girl, whom the main character leaves his good wife to marry, turns out to be an ugly, revolting individual, and the less striking, good wife is the one who finally brings him happiness.

Although wealth, youth, and beauty are valued in Hmong culture, frequently in the stories those who appear to be poor, old, or ugly turn out to be of great value. For example, in ''The Toad Son-in-Law,'' the princess is required by her parents to marry a toad who magically turns into a handsome, wealthy prince.

Magical/Mystical Story Elements

Because the stories of a culture reflect its values and beliefs, stories are a good source of information about a culture. Belief in the supernatural is common in Hmong culture. Hmong stories include a great deal of magical and mystical elements, such as the following:

In ''The Story of the Plain of Jars,'' Shee Na's wife, Ngao Njua, is taken by the king to be his eighth wife. Unhappy about that, she finds that when she is sad, it rains and when she is happy, the sun shines.

Shee Yee, in ''Shee Yee and the Evil Spirits that Ate People and Drank Blood,'' is transformed into a water buffalo, a cloud, a drop of water, a deer, a caterpillar, a red ant, and a girl in his fight against the evil spirits.

Magical events occur in virtually all Hmong stories. In several stories a house was built overnight by some helpful spirits, animals think and speak like human beings, and plants take on human characteristics. These events and circumstances are commonplace in the Hmong stories and are a reflection of the culture from which they come.

DISCUSSION

Among the information sources needed by readers to comprehend text are two that were of concern in this study: knowledge of narrative text structure and cultural schemata. Regarding the first factor, it seems that the Hmong stories analyzed in this study adhered to the Thorndyke (1977) story grammar. Most stories began with a description of setting information, usually the main character(s). Most of the stories established a problem early on and outlined a series of events that occurred in natural time order sequence that led to the resolution of the problem. The only major difference was that some of the Hmong stories included more than one story within the text. Since there seemed to be few major structural differences between these Hmong stories and similar folk stories from Western tradition, it seems that Hmong students could comprehend stories that follow that structure.

An additional source of information needed by readers to comprehend text is knowledge of the culture described in the text. Steffensen et al. (1979) point out that when a reader from one culture reads a story that includes crucial information from another culture, that reader will likely experience difficulty with comprehension. Readers must possess adequate background knowledge or experience so they can apply that knowledge in understanding the text. Although this is true for all readers, it is especially important for readers from a culture different from that of the author of the text.

Although the Hmong stories analyzed in this study adhered to the Thorndyke story grammar quite closely, they represented a specific culture. Many of the events, motives, and situations in the stories would be familiar to members of Hmong society. However, they would be unfamiliar to those outside that group. For example, in one Hmong story a man who is being chased by other men is told by a voice to climb a tree to avoid being captured. The reader is neither told from where the voice came nor who told the man to climb. But conversation with a Hmong man revealed that the voice was, of course, that of an ancestor whose mission it was to protect its progenitors in that area. Readers outside the Hmong culture would have difficulty resolving apparent inconsistencies such as this one and would likely miss subtle nuances that add meaning and feeling to the stories. But for the Hmong, events such as this would be easily inferred.

Just as readers outside Hmong culture may experience difficulty comprehending folk tales of the Hmong, so the Hmong may also confront comprehension problems while reading stories from cultures other than their own. Although the structure of the Hmong stories seem to equip them to deal with stories they will probably face in American schools, it is questionable whether Hmong children have the cultural background necessary to comprehend those stories. As a result, until this potential for comprehension impairment can be further identified and defined, it appears that Hmong readers would benefit from background building experiences and activities prior to reading stories.

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A CRITICAL REVIEW OF READING IN MATHEMATICS INSTRUCTION: THE NEED FOR A NEW SYNTHESIS[1]

Marjorie Siegel, Raffaella Borasi, and Constance Smith
University of Rochester

In recent years, researchers and practitioners alike have shown renewed interest in the problem of "reading mathematics." This trend is part of a more general movement toward teaching reading as an integral part of content area instruction. Responding to difficulties students experience when learning from text, educators have proposed that reading strategies appropriate to each subject matter be included in the curriculum. Reading mathematics, in particular, presents a challenge due to the unique qualities of mathematics textbooks.

Existing reviews of the literature on "reading mathematics" (Nolan, 1984; O'Mara, 1981; Pinne, 1983) indicate that researchers have concentrated on two dimensions: (a) the language of mathematics, with particular emphasis on technical vocabulary employed in teaching and learning mathematics; and (b) comprehension of word problems, with attention to the way the syntactic and semantic organization of word problems affects their solution.

Our own critical reading of these reviews, as well as more recent contributions (e.g., Cox & Wiebe, 1984; Cordeiro, 1988; Ferguson & Fairburn, 1985; Moyer, Moyer, Sowder, & Threadgill-Sowder, 1984; Moyer, Sowder, Threadgill-Sowder, & Moyer, 1984; Van Den Brink, 1987), confirms that these topics constitute the bulk of research on reading mathematics, to the exclusion of almost any others.

This preliminary look at the literature suggests that thus far the problem of "reading mathematics" has been interpreted as follows: Reading can be an obstacle to learning mathematics if students lack reading skills necessary to correctly decode mathematical texts; researchers and teachers should eliminate this obstacle by developing instructional strategies that teach the skills of reading mathematics. This statement of the problem leaves any theoretical perspectives implicit, though, on closer examination, it is clear that a very specific view of both reading and mathematics is operating. Once these embedded theories are made explicit, alternative conceptualizations of reading and mathematics, and, consequently, of "reading mathematics," become possible. The present review of the literature on reading mathematics, therefore, will interpret results of existing research in light of a new synthesis of mathematics and reading.

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ALTERNATIVE PERSPECTIVES

Perspectives on Mathematics

Most people equate mathematics learning, especially at the elementary level, with the acquisition of some technical skills, beginning with the ability to perform computations with a degree of accuracy. Students then move on to skills needed to successfully apply these techniques, for example, solving word problems or deducing formal geometrical proofs according to established logical rules and formats. This view is reinforced in the current precollege mathematics curriculum and in most standardized measures of mathematical achievement.

Most mathematicians, on the other hand, would argue that these skills represent a very small part of what mathematics is all about; indeed, many would say these are the least interesting kinds of mathematical thinking, where machines can best substitute for human performance. In contrast to the more popular view, mathematicians regard mathematics as a *way of knowing* (Bishop, 1988), a particular mind-set for approaching the generation, framing, representation, and solution of problems. Hence, ''learning mathematics'' cannot be reduced to the passive acquisition of facts, rules, and techniques but should include an appreciation for the process through which new mathematical knowledge is constructed and evaluated (Kline, 1980; Lakatos, 1976), the value-laden nature of problem formation and resolution (Brown & Walter, 1983), and the affective dimensions of mathematical work (Buerk, 1982; Leder, 1982; Oaks, 1987; Resek & Rupley, 1980), among others.

Further, some scholars (see, e.g., Borasi, 1986; Brown, 1982; Buerk, 1985) argue that mathematics students should become more aware of the humanistic dimensions of mathematics. They point out that mathematics is not a black-and-white, cut-and-dried subject, as most people think, but that even in this discipline ambiguity, controversy, and doubt play an important role in the creation of new knowledge and the learning of established results. Awareness of the humanistic nature of the discipline will help students appreciate that thinking, creativity, and personal judgment are necessary if mathematics is to be successfully learned and used. And, a humanistic concept of mathematics as a discipline may help combat the phenomenon of ''math avoidance,'' widespread even among talented people.

Increasingly, the mathematics education profession is coming to appreciate this view of mathematics and realize it will require a rethinking of the goals, and consequently, the content and instructional practices, of the precollege mathematics curriculum. For example, the National Council of Teachers of Mathematics has recently set forth the following key goals for mathematics students in the 1990s: becoming a mathematical problem solver, learning to communicate mathematically, learning to reason mathematically, valuing mathematics, and becoming confident in one's ability to do mathematics (National Council of Teachers of Mathematics, 1989). These goals represent a radical departure from the technique curriculum that is so pervasive in American classrooms and open the door to a reconsideration of the role reading might play in learning mathematics. New goals for mathematics education would have an impact on the reading material considered appropriate and valuable for mathematics instruction, as well as the knowledge, strategies, and attitudes one would hope to foster as a result of reading experiences.

In a technically oriented mathematics curriculum, reading instruction is limited to teaching skills necessary to comprehend information contained in textbooks, such as descriptions of algorithms, theorems and proofs, and word problems. The goal of such reading instruction is the appropriate use of such information in solving assigned problems. A curriculum grounded in a view of mathematics as a *way of knowing* would welcome other kinds of reading materials in addition to textbooks. Historical essays providing insights on how mathematical knowledge is achieved, philosophical arguments on the nature of mathematics and its applications, and stories and poems that illustrate aesthetic, affective, and value-laden aspects of mathematics are examples of what we call "rich mathematical texts." These materials have the potential to help students gain new insights into the process and nature of mathematics. This potential may be lost, however, if *reading* is not clearly understood by mathematics teachers.

Perspectives on Reading

The shift from a skills-based to a comprehension-based model of reading is well-documented in the reading education literature (see, e.g., Anderson, Hiebert, Scott, & Wilkinson, 1985; Harste, 1985). In general, the reading profession has rejected the notion that reading is a set of skills mechanically applied to text so as to extract information. This perspective portrays the reader as a passive information processor; the process is dominated, instead, by the text. Instruction focuses on ways to "decode" text (e.g., word recognition, vocabulary instruction) and successful comprehension is measured by the reader's ability to recover the author's meaning and duplicate the text.

The idea that reading is a *mode of learning* suggests the reader plays an active role in the process, bringing linguistic and domain-specific knowledge, as well as beliefs, attitudes, and strategies to the situation (Anderson & Pearson, 1984; Carey & Harste, 1985; see, also, Gollasch, 1982, for the collected works of K. S. Goodman). Reading is thus seen as a fluid, dynamic process in which new meanings are generated from the negotiation of reader, text, and context (Carey, Harste, & Smith, 1981; Rosenblatt, 1978; Siegel, 1984). From this perspective, text serves as a springboard for constructing meanings; duplicating the text is no longer the criterion for successful comprehension. In brief, reading can be thought of as a *mode of learning*, an authoring process (Rowe & Harste, 1986), in which readers transform texts into meanings mediated by their experiences, knowledge, and the context of the reading event.

Reading instruction which fosters the understanding that reading is a mode of learning would introduce strategies that encourage readers to be active meaning makers by making connections to other texts and contexts. Of particular interest are strategies that encourage readers to take a new perspective by transforming text through writing, drawing, drama, or other communication systems (Grumet, 1986; Rowe & Harste, 1986; Siegel, 1984). It is possible that the use of generative reading strategies might help students learn from the rich mathematical texts described earlier.

Perspectives on Reading Mathematics

When combined, these perspectives on reading and mathematics yield four distinct approaches to the integration of reading and mathematics, illustrated in Figure 1. This

	Mathematics as a body of facts and techniques	Mathematics as a way of knowing
Reading as a set of skills for extracting information from text	I	III
Reading as a mode of learning	II	IV

Figure 1. A grid for framing the problem of "reading mathematics."

theoretical grid offers a way to re-view existing literature on reading mathematics. Determining the approximate location of specific studies in this scheme allows us to discuss their contributions and limitations as well as their potential to promote an understanding of mathematics as a way of knowing.

FOUR ALTERNATIVE FRAMEWORKS FOR "READING MATHEMATICS"

Box I: Extracting Information from Technically-oriented Mathematics Texts

Most of the existing literature on "reading mathematics" falls into this category. Researchers working within this framework have identified what they believe to be major obstacles presented by mathematics texts and have studied effects of instructional strategies designed to overcome these obstacles. Text features such as the specialized vocabulary of mathematics and the syntactic organization of word problems were the most frequently studied obstacles.

Existing reviews of research (Nolan, 1984; O'Mara, 1981; Pinne, 1983) all indicate that direct teaching of the specialized vocabulary of mathematics contributes to improved success with problem solving. For example, Skyrpa (1979) found that teaching mathematical vocabulary can improve students' ability to solve mathematical problems. The emphasis on understanding as well as decoding words in this study is critical. Earp and Tanner (1980) found sixth graders could decode but not give meanings of mathematical terms commonly found in mathematics texts; however, students were able to give definitions when terms were placed in the context of a sentence, leading the researchers to conclude that mathematical texts do not provide much support for comprehension.

Researchers have also given a good deal of attention to the syntactic organization and format of word problems, which are often identified as major stumbling blocks for students. Moyer and his colleagues (Moyer, Moyer, Sowder, & Threadgill-Sowder, 1984; Moyer, Sowder, Threadgill-Sowder, & Moyer, 1984) have examined effects of three different formats of story problems on students' ability to choose the correct operation needed to solve the problem. In the first study, students in Grades 3–7 were tested on their ability to extract information from problems written in a telegraphic format and in a verbal format. Results did not support the hypothesis that the telegraphic format would be easier for students; there was some indication that the verbal format was easier. In the second study, they compared three formats: telegraphic, verbal, and drawn; the drawn format included a drawing of the objects, with labels, included in the problem. Here again they found no difference between the effects of telegraphic and verbal formats on ability to select the correct operation; however, a significant reading level by format interaction was found. The means for the drawn format were significantly higher at each reading level than the means for the other formats, and particularly so for students identified as low readers. In contrast, a study by Blohm and Wiebe (1980) showed that inclusion of diagrams had no effect on high school students' success in solving mathematics problems involving computation of percentages. The authors note, however, that diagrams may not have served the function they were intended to serve, namely, as an aid to learning. This study also explored effects of including extraneous information in the problem. Results indicate that inclusion of extraneous information greatly interfered with students' problem solving.

On the whole, these studies are grounded in an implicit theory of reading which assumes that readers are passive and, hence, text factors (vocabulary and the syntactic organization of word problems) are the key variables in reading mathematics. Though comprehension is the intended result of such text manipulations, it is interpreted in a very limited manner as extracting information necessary for solving the problem.

In summary, this approach to reading mathematics, though it might contribute instructional strategies that increase students' ability to solve well-defined problems, fails to exploit the potential that might come from an integration of reading and mathematics. In fact, the belief that the "reading" component creates an obstacle to learning mathematics may lend support to the existing trend toward minimizing the use of reading in mathematics instruction. If mathematics educators continue to see the characteristics of reading mathematics texts (such as their density and the need to read them with "paper and pencil" [Nolan, 1984]) as a problem, they will miss a valuable opportunity to help students understand that any text requires active construction of meaning.

Box II: Reading to Learn so as to Achieve the Goals of a Technically-oriented Mathematics Curriculum

Contributions within this framework are much rarer; however, a few studies can be noted if we include those that clearly give the reader an active role in the process. These studies tend toward a narrow interpretation of comprehension due to the nature of the reading task. In other words, the notion that comprehension involves construction of new meanings is not considered appropriate when the task of the reader is to correctly solve the word problem.

McCabe (1981) applied a language experience approach to the comprehension of mathematics textbooks. He assessed ninth graders' understanding of a textbook passage using a cloze procedure. He then asked students to explain a section of the book in their own words. Using the syntactic patterns identified in the students' explanations, the researcher repatterned the passage and reassessed students' comprehension, again with a cloze technique. McCabe found that students' comprehension of mathematics materials improved when the passage was patterned after their own syntactic structures. Other reading educators have pointed to the promise that a language experience approach holds for mathematics instruction (Ferguson & Fairburn, 1985), and this topic deserves further study.

A strategy that invited students to be active meaning-makers was used in a study examining the effect of the format of word problems in problem solving ability (Cohen & Stover, 1981). In the first part of their project, gifted sixth graders were asked to rewrite word problems to make them easier for their peers; content analysis of their efforts led to the identification of format variables that might affect comprehension of word problems. This rewriting activity is an example of a reading strategy that calls for comprehension in the spirit of "reading as a mode of learning." To rewrite word problems, students had to decide what needed to be changed, thus engaging in problem formation. In addition, the activity required that students shift from reading to writing, a move which helped them take a different perspective on the text and transform it in a personally meaningful way.

However, the mathematical goal implied by the activity was still limited to accurate information processing, and strictly technical mathematical texts (i.e., traditional word problems) were employed. Notice that students were not encouraged (or even allowed) to change the content of the problem, and to explore the mathematical consequences of such modifications—a valuable mathematical activity that would promote problem generation. Indeed, follow-up interviews with students indicated they defined the rewriting task as a reading activity, not one related to learning mathematics.

An opening to the consideration of nontraditional mathematics texts, such as newspapers (Becker & Kendall, 1982; Haggerty, 1986) and material written by the students themselves (Van Den Brink, 1987), was found in the practitioners' literature. These contributions suggest new ways reading and writing can be used in mathematics instruction, and involve students in activities promoting the construction of meaning. Yet, they belong to Box II because their definition of relevant mathematical content and activities is still very much limited to computations and solutions of traditional word problems, however more interesting when encountered in meaningful contexts.

Box III: Rich Mathematical Texts Are Introduced to Provide Students with Information on Important Aspects of Mathematics Typically Excluded from the Mathematics Curriculum

Not surprisingly, contributions to this framework represent efforts by mathematicians and mathematics educators to introduce aspects of mathematics typically excluded from the traditional mathematics curriculum. The mathematics education community has long recognized the need for texts that communicate the nature of mathematical results, as well as information about their origin and applications, to students. In response, various collections of novel as well as classic, yet nontraditional, mathematics texts have been proposed (see, e.g., Aleksandrov, Kolmogorov & Lavrenti'ev, 1963; Borasi & Brown, 1985; Campbell and Higgins, 1984; Newman, 1956) as a complement to traditional mathematics textbooks. These efforts reveal the existence of a number of very interesting essays, dialogues, stories, and even poems, which address mathematical topics and issues often neglected by the current precollege curriculum. Examples include the classic dialogues by Galileo Galilei (1914), in which various mathematical problems and even paradoxes are discussed in a highly understandable and thought-provoking way, illustrating the thinking process a mathematician would use to approach such situations; or, novels such as *Flatland* (Abbott, 1952), where the reader's experience and imagination is called upon to intuitively understand and explore something as abstract as a four-dimensional space.

All these authors, however, seem to have felt that their task was accomplished once appropriate mathematical texts were produced—evidence, we would argue, of their implicit theory of reading as a straightforward matter of extracting information conveyed in their books. Since mathematics teachers do not see themselves as reading teachers (Singer & Donlan, 1980) and are usually unaware of reading research and instructional strategies, it is unlikely that they would take the initiative to develop reading experiences supporting students' active comprehension and learning from these texts. Hence, the potential power of these rich mathematical texts to add new dimensions to the mathematics curriculum remains largely unexploited.

Box IV: Reading to Learn Mathematics to Understand Mathematics as a "Way of Knowing"

Can reading be viewed as an *opportunity* to learn mathematics rather than as an obstacle standing in the way of such learning? Our review of the literature on reading mathematics suggests that educators have not yet framed the problem of reading mathematics in this way. Hence, there is a need for a new synthesis of reading and mathematics, one which views reading as a mode of learning so as to contribute to the goals of a mathematics curriculum that focuses not so much on acquisition of techniques, but on the process of doing mathematics and the more humanistic aspects of this discipline.

One example of reading to learn mathematics was located in the literature. In this case, a teacher described how her sixth graders played with the concept of infinity through reading, writing, and art (Cordeiro, 1988). The concept of infinity is not usually part of the elementary school mathematics curriculum and the teacher's emphasis on open-ended, collaborative inquiry into the concept is equally unique. Though reading strategies in the unit were not discussed in detail, inclusion of such writing experiences as freewriting suggests students were encouraged to be active meaning-makers. One can easily envision the way an "authoring curriculum" (Rowe & Harste, 1986), that encourages students to construct their own interpretations by transforming texts into other genres and communication systems, could incorporate rich mathematical texts. By emphasizing problem formation, risk taking, collaboration, and meaning making, this new synthesis of reading and mathematics might help students achieve the goals identified by the National Council of Teachers of Mathematics.

CONCLUSION

In this paper, we have reviewed research on reading mathematics in light of four alternative perspectives on the problem. Though most of the existing literature on this topic falls into box I, other interpretations of "reading mathematics" are possible.

Understanding that the problem of reading mathematics can be framed differently, depending on the way reading and mathematics are conceptualized, opens up the possibility of a new synthesis which we call "reading to learn mathematics."

Reading to learn mathematics calls for a new relationship between reading and mathematics educators as well as a new agenda for research and practice. The work reviewed in Boxes II and III were products of either reading or mathematics educators alone. This work shows the promise new directions in each field have for the problem of reading mathematics; and yet, these new directions cannot be fully explored due to the limited views these researchers have of the other field being investigated. If, on the other hand, specialists from both fields join together in genuine collaborations, a new powerful synthesis of reading and mathematics instruction can be forged.

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TRANSFER EFFECTS OF INSTRUCTING POOR READERS TO RECOGNIZE EXPOSITORY TEXT STRUCTURE

Renee Weisberg
Beaver College

Ernest Balajthy
State University of New York at Geneseo

Many researchers and theorists have advocated use of active, strategic learning for improved comprehension (Anderson, 1980; Ausubel, Novak, & Hanesian, 1978; Rothkopf, 1981; Weinstein, 1982). Several studies have found training in use of graphic organizers as an active learning strategy has beneficial effects on students' comprehension and summarizing (Berkowitz, 1986; Weisberg & Balajthy, 1985, 1986, 1988). Such studies have often used artificially constructed texts with consistent organizational patterns. However, real-life material encountered by students is rarely so well organized (Schallert & Tierney, 1981). Questions have been raised as to the practical transfer benefits of such training (Taylor, Olson, Prenn, Rybczynski, & Zakaluk, 1985). The comparison/contrast text structure presents special challenges for less able readers (Englert & Hiebert, 1984; Raphael & Kirschner, 1985; Richgels, McGee, Lomax, & Sheard, 1987) who have difficulty summarizing even easier text structures (Head & Buss, 1987).

Previous research has indicated a relationship between prior content knowledge and knowledge of text structure in terms of their influence on comprehension. Text structure clues may be particularly important for aiding comprehension in low prior knowledge conditions (Afflerbach, 1986). Results of a study by Weisberg and Balajthy (1986) have indicated that teaching subjects to recognize the passage's text structure led to greater gains in subjects' comprehension when they knew little about the passage's topic than when their prior knowledge was moderately high.

A review of the literature on transfer of training in expository text structure suggests that, in addition to training in recognition of text structure, a critical subset of other learning strategies must also be taught for transfer to occur (Armbruster, Anderson, & Ostertag, 1986; Herber & Herber, 1987; Johnston, 1985; Piccolo, 1987; Pressley & Levin, 1983). Students should participate in more than one learning activity, such as constructing graphic organizers and writing summaries. Students should be taught some form of restatement, such as paraphrasing or summarizing, either orally or in writing. Students should receive practice and feedback on strategy use. Each of these strategies was incorporated in this study.

This research investigated critical factors involved in recognizing and using text structure during reading and summarizing, examining the transfer effects of training below average readers in high school in use of graphic organizers and summary writing on their recognition of comparison/contrast text structure. Passages used during training had been rewritten to make the comparison/contrast organizational pattern salient. For the transfer tasks, subjects' own classroom materials were used in which the organizational structure was not as clearly apparent as in the rewritten training passages. The researchers sought to determine whether less able readers could transfer the strategies they had used successfully during training to real-world content materials regardless of their knowledge of the passage's topic. Would their posttraining graphic organizers, summaries, and answers on comprehension tests reflect recognition of the text structure and contain important passage information?

METHOD

Subjects

Subjects were 32 high school students who had been placed in a reading class because their standardized test scores were below expectancy. The experimental group consisted of 5 males and 11 females. The control group consisted of 9 males and 7 females who received alternative reading instruction during training of the experimental group. The alternative instruction consisted of reading and teacher-led discussion of short stories. The experimental group had 8 tenth graders, 5 eleventh graders, and 3 twelfth graders. The control group had 7 tenth graders, 5 eleventh graders, and 4 twelfth graders.

Scores on the comprehension subtest of the Stanford Diagnostic Reading Test was 45.7 for the experimental group, corresponding to the 23rd percentile, with a percentile range from 1 to 67, and, for the control group, was 47.4, corresponding to the 25th percentile, with a range from 2 to 46.

Training

Materials. Twelve social studies expository text passages were used, each of which had a comparison/contrast internal organization. For example, one passage compared the San Francisco earthquake of 1906 to the 1964 Alaska earthquake. Each training passage was taken from a textbook and adapted to create a tightly constructed comparison/contrast organizational pattern. Mean passage length was 257 words and mean readability was sixth grade (Fry, 1977).

Procedure. Instruction was carried out by the researchers. Experimental group subjects received six training sessions of 40 minutes each over a 3-week period. Daily feedback was provided and all student work was graded. Students were taught why recognition of specific organizational patterns in text could improve their reading comprehension and how to recognize signal words cuing comparison/contrast information. Instruction included explicit rules and modeling for constructing graphic organizers and writing summaries. Students were trained to follow this basic procedure: (a) read the passage to identify topics and categories of comparisons; (b) underline signal words to identify comparisons and contrasts; (c) construct a graphic organizer; (d) synthesize comparisons and contrasts into a written summary (for this task, the original passage was removed); (e) study the graphic organizer and summary in preparation for a comprehension test. Organizers were created by placing topics being compared (such as "San Francisco earthquake" and "Alaska earthquake") in boxes side by side across the top of their paper. Then categories of comparisons (such as "amount of damage" and "duration of destruction") were listed in boxes vertically down the middle. Specific contrastive facts for each category were then written on appropriate sides of the category label. Students wrote their summaries using only information from the graphic organizers to avoid their copying entire sentences from the passage.

Transfer Task

The transfer task was carried out 1 month after experimental group training had been completed. By prior arrangement with classroom teachers, no instruction or practice in either graphic organizers or summarization was carried out in the interim.

Materials. Two social studies comparison/contrast passages drawn from the students' classroom current events reading were used. Passages were not adapted, as had been the training passages, but were used to determine ability of students to transfer their performance to real-world content area textual material. Mean length was 692 words, much longer than the mean training passage length. Mean readability of the low prior knowledge passage was tenth grade and of the moderate prior knowledge passage twelfth grade (Fry, 1977).

A preliminary test of prior knowledge, requiring a written protocol from subjects (Marshall, 1988), was carried out before training began. The test requested students to write three facts about each topic. One passage, on the topic of nuclear power plant disasters, was designated as a moderate prior knowledge passage based on this preliminary testing. The other passage, on the topic of the death penalty, was designated as low prior knowledge. Passages were administered in counterbalanced order.

Procedures. The control group had received alternate comprehension instruction during the time in which the experimental group was trained. However, immediately prior to the transfer task they were given a one-half hour presentation introducing them to comparison/contrast graphic organizers, so they could complete the transfer task. The presentation included constructing a graphic organizer to indicate they understood the procedure.

All subjects read the passage and underlined important contrastive information, then constructed graphic organizers. The passages were collected and subjects wrote summaries based on their graphic organizers. All materials were then collected and subjects completed a comprehension test of five questions for each passage. The questions addressed all major contrasts in each passage. For example, one question read:

> An important way in which Chernobyl was a worse nuclear disaster than Three Mile Island was ______________________________.

Questions were created by the researchers and verified for passage dependency by them and by the classroom teachers.

Scoring and Data Analysis

A master template of the comparison/contrast idea structure was obtained by parsing the text into idea units and constructing a grid of the comparisons and contrasts within the text. The researchers created the grid and consulted with the classroom teachers for accuracy. The graphic organizers and the summaries were scored separately against this template of idea units. Each score was the percentage of items on the master template which had been included. Both researchers scored the measures individually, and minor differences were resolved in discussion.

Three dependent variables were established for each of the two transfer passages, each based on percentage of correct responses: (a) a graphic organizer score which assessed student understanding of the passage structure, (b) a quality of summarizing score, and (c) a comprehension test score.

RESULTS

Results were analyzed using MANOVA with three dependent Task variables (percentage scores obtained for each subject on use of graphic organizers, summarizing, and comprehension). The between-subjects factor was Group (trained and untrained). The within-subjects factor was Prior Knowledge (low and moderate). (Means and standard deviations for each are reported in Table 1.)

The main effect for Group was statistically significant, multivariate $F(3, 28) = 11.618$, $p < .0001$. The effect for Prior Knowledge was also statistically significant, $F(3, 28) = 37.804$, $p < .0001$. In addition, the effect for Task was significant, $F(3, 28) = 122.628$, $p < .0001$. The Group × Prior Knowledge interaction was not significant.

Individual univariate ANOVAs indicated statistically significant differences between groups in all except one case, and effect sizes were calculated based on procedures described in Cohen (1977). Effect for graphic organizers was significant in the moderate and low prior knowledge conditions, $F(1, 30) = 12.51$, $p < .001$, and $F(1,$

Table 1

Mean Results (and Standard Deviations) in Percent by Group

	Graphic Organizer	Summary	Test
Experimental Group[a]			
Low Prior Knowledge	52.00 (22.03)	30.13 (22.81)	33.50 (24.68)
Moderate Prior Knowledge	63.69 (13.29)	45.69 (20.78)	79.94 (23.20)
Control Group[a]			
Low Prior Knowledge	21.75 (25.72)	1.50 (3.22)	31.88 (23.44)
Moderate Prior Knowledge	44.56 (17.06)	15.88 (14.93)	60.13 (23.77)

[a] $n = 32$.

30) = 12.77, $p<.0001$, respectively. Effect sizes were in the high range, 1.08 and 1.07 respectively. Effect for summarizing was significant in both the moderate and low prior knowledge conditions, $F(1, 30) = 21.71$, $p<.0001$, and $F(1, 30) = 24.71$, $p<.0001$. Effect size was high, at 1.28 and 1.32. Effect for comprehension in the moderate prior knowledge condition was significant, $F(1, 30) = 5.69$, $p<.05$, but not in the low prior knowledge condition. Effect size for the moderate prior knowledge condition was in the high range, .79, and for the low prior knowledge condition it was in the very low range, .07.

DISCUSSION

Results indicated that transfer of training to real-world reading tasks did occur for both moderate and low prior knowledge passages. These results were obtained after a delay of 1 month between training and the transfer task, suggesting learning strategies taught did maintain their effectiveness for these subjects after cessation of training.

These findings help validate past studies in which researchers have employed posttest passages adapted from content materials to highlight the text structure. Positive results from such studies are apparently transferable to real-world content materials, as indicated by the main effect for group. The experimental group was able to apply their text learning strategies to real-world textbook materials. Their improved ability to identify text structure, as measured in the graphic organizer task, was maintained as they dealt with less organized passages characteristic of textbooks. This ability is crucial to comprehension and retention of text content. Their ability to summarize, crucial to learning key concepts in textual material, was maintained as they dealt with textbook passages in which main ideas were less clearly stated than in the artificially structured passages used during training. Finally, ability to comprehend was maintained in the transfer task in the moderate prior knowledge condition.

The main effect for prior knowledge was expected, as readers comprehend (Afflerbach, 1986; Johnston, 1984) and summarize (Weisberg & Balajthy, 1986; Pratt, Luszcz, McKenzie-Keating, & Manning, 1982) higher topic familiarity passages better than passages with low topic familiarity. Previous research has suggested comprehension of low prior knowledge passages is improved by training in graphic organizers while comprehension of higher prior knowledge passages is not (Weisberg & Balajthy, 1986). The present study expanded understanding of past findings by examining two degrees of prior knowledge. There was a significant difference between the groups for the moderate prior knowledge passage on every transfer task. Findings for the lowest prior knowledge condition, however, were more complex.

On the low prior knowledge task, why were subjects able to transfer training to their graphic organizers, which reflected their recognition of text structure, and to summaries, which contained important contrastive information, but not to the comprehension task? Training apparently enabled the experimental group to recognize text structure better than the controls. Perhaps summaries were significantly better for the experimental group because they were written from the more complete information in their graphic organizers. Recognition of text structure as reflected in these two tasks was improved by training, but when the topic familiarity was low, recall of passage information was low. Less prior knowledge of passage topic may have influenced comprehension more than subjects' ability to recognize text structure.

Prior knowledge of this topic was apparently so low, and the topic therefore so difficult, that subjects could not bring their strategies to bear in effectively improving memory of the passage. Average comprehension of the passage was 31.88% for the untrained controls, even after they had created graphic organizers and written summaries. Students had no problem in recognizing one or two of the more common issues involved in the debate over the death penalty, such as the possibility that an innocent person could be executed. Most of the passage, however, dealt with moral and theological issues that would have been unfamiliar to most students.

Limitations of the transfer to real-world materials in this study must be noted. Training was carried out using a specific text structure, with materials rewritten to make the structure clear. Posttest transfer passages also employed that structure, although transfer passages were not rewritten for clarity of structure. Whether training in one text structure will transfer to another is an issue not addressed in this study. Also not addressed is the issue of transfer between content areas. As Tobias (1987) has noted in his survey of research on the generalizability of aptitude-treatment interaction research, there is little evidence that learning strategies automatically transfer across content areas.

Subjects in this study were all poor readers dealing with, for them, very challenging text. Further study is necessary to determine with what kinds of students and with what kinds of texts this training is effective. As McKeachie (1988) has noted, research on learning strategies has long since recognized the futility of "horse race" studies that pit one strategy against another. Instead, researchers have focused on issues of why and under what circumstances particular strategies are effective. Previous research had indicated effectiveness of spatial learning strategies, such as graphic organizers, for improving achievement (Holley & Dansereau, 1984). Weisberg and Balajthy (1985) had found indications that such strategies are effective with poorer readers by improving students' ability to recognize text structure to locate and remember key ideas within that structure. This study suggests these strategies have applicability to real classroom reading materials.

Paris, Wasik, and Van der Westhuizen (1988) have criticized much metacognitive intervention research as lacking ecological validity. The present study was concerned with practical translation into classroom settings and integration within the school curriculum. Intervention was carried out in students' own classrooms with consent and encouragement from classroom teachers.

Classroom teachers reported students continued to use graphic organizers in learning content area subjects after conclusion of the study. Students appreciated the usefulness of identifying and summarizing main ideas, hoping this would improve their ability to take tests in content areas. They also found construction of graphic organizers to be enjoyable. Teachers were especially appreciative of learning a method that integrated writing with reading. Since students understood that text information is often written in specific patterns, teachers said they could apply this knowledge in instructing them how to organize their compositions.

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EFFECTS OF MNEMONIC IMAGERY TRAINING ON FOURTH GRADERS' RECALL OF CONTENT MATERIAL

Nancy L. Williams, Bonnie C. Konopak and John E. Readence
Louisiana State University

One of the most researched forms of mnemonics in the past 10 years has been the *keyword method*, a technique using imagery to link new and known information to facilitate learning (Pressley, Borkowski, & Johnson, 1987). This method requires the learner to (a) recode the new fact into a more familiar keyword that is orthographically or acoustically similar, (b) relate the keyword and new fact within an interactive concrete image, and (c) upon encountering the new fact, use the mnemonic keyword/image to retrieve the appropriate response (Levin, 1983). For example, the target word *carlin*, meaning "old woman," can be transformed into the perceptually similar keyword *car*. This keyword is related to meaning through the image of an old woman driving a car. When the learner next sees *carlin*, the keyword *car* is recalled, the mnemonic image of the old woman driving a car is retrieved, and the learner responds with "old woman" (Pressley, Levin, & Miller, 1981).

Keyword imagery is viewed as an important learning strategy as it is tied to memory schemata (Bellezza, 1987). Similar components of both processes include: constructability, associability, discriminability, and invertibility. That is, cues that are easily generated during the learning process, that relate to prior experiences, that are not confused with the other cues, and that have a bidirectional association are more likely to be effective in recall of facts. For example, the keyword *car* is familiar to a vast majority of learners, as is the image of an *old woman*. Therefore, such a mnemonic image is easily generated, as the schemata for both elements are those frequently used. The image is also associative as real world objects are used, yet not so confusing that it is indiscriminable. Additionally, such an image is bidirectional since the new information *carlin* is first presented and then followed by the schematic information of *car* and *old woman*. During recall, the schematic information stimulates the responses of the new information.

The majority of research in this area has focused on students' learning of foreign vocabulary (Atkinson, 1975), infrequent English vocabulary (Levin, 1982), and isolated content facts (Levin, 1983). This research has generally used oral experimenter statements or limited student reading and immediate posttesting procedures in its methodology (Pressley, Levin, & Delaney, 1982). To have implications for classroom learning, more recent investigations have tested the keyword method using actual reading materials. Peters and Levin (1986) examined effects of mnemonic imagery on good and poor junior high school readers' recall of short fictional passages and longer nonfictional passages and found mnemonic benefits for both ability groups. To examine the keyword method in content classrooms, Levin, Morrison, McGivern, Mastropieri, and Scruggs (1986) had eighth graders practice and apply three strategies during expository text reading and found statistically significant results for the mnemonic treatment group on both immediate and delayed posttests. In modified replications of Levin et al. (1986), adding class instruction prior to reading, Williams and Konopak (1988) found positive results for sixth-grade students, whereas Konopak and Williams (1988) found similar results for eighth-grade students.

In contrast to previous studies, the present investigation attempted to extend mnemonic imagery research for classroom use by using ecologically valid materials and procedures in a natural classroom context. Participating subjects were fourth graders in the process of developing study techniques while making the transition from basal to expository text reading. This method was contrasted with study strategies most commonly found in a review of 12 fourth-grade basal manuals. Instructional materials included a chapter from the subjects' science text rather than researcher-contrived materials. Finally, class instruction within a 3-stage framework with activities before, during, and after reading was included to adhere to a more traditional class routine.

METHOD

Subjects

Subjects were 60 fourth graders enrolled in two self-contained classes at a southeastern university laboratory school. Intact classes were randomly assigned to either a mnemonic treatment group or a notetaking/rereading control group. Based on standardized reading test percentile scores (Stanford Achievement Test), the mnemonic group with 30 subjects had a mean score of 67.48 ($SD = 20.40$), while the control group also with 30 subjects had a mean score of 69.26 ($SD = 23.51$). Two preliminary t-tests between group means indicated there were no significant differences in reading ability or prior knowledge of the content material. During the 5 days of data collection, 5 subjects in each group were absent on one or more days and were dropped from the data analysis.

Materials

The instructional material was an unread chapter on rocks and minerals from the fourth-grade science text (Mallinson, Mallinson, Smallwood, & Valentino, 1984) used by the two classes. Assessment materials included a test of prior knowledge, an immediate identification task, delayed probed recall and identification tasks, a study strategy questionnaire, and daily class notes.

The test of prior knowledge was a list of 12 conceptual terms from the chapter. Subjects wrote any information they knew regarding these terms. The immediate and delayed identification tests were different 12-item tests constructed from an item pool of literal and inferential definitions of rocks described in the chapter. The subjects were to classify these rocks as being *igneous*, *sedimentary*, and *metamorphic*. The probed recall was a list of the three major rock categories. Here, subjects were to indicate how these rocks were formed and to name two examples of each. The study strategy questionnaire consisted of three questions: (a) What study strategy did you use to study the information on rocks? (b) How helpful did you find this strategy? (c) Would you use it again in science or another subject area? Class notes were collected to examine study strategies used over the 3-day experiment.

Procedure

Prior to treatments, subjects completed the test of prior knowledge to examine any initial differences by experimental group. Each of the items was scored from 0 (no knowledge) to 3 (complete knowledge), with 36 points possible. Scores ranged from 0–5, indicating no/minimum knowledge of this topic for both groups. Then, over 4 days, the groups were given instruction in mnemonic imagery or traditional notetaking/rereading in a unit on rocks and minerals. In addition, subjects in both groups took class notes on daily activities.

Mnemonic treatment group. On Day 1, one of the researchers introduced the keyword method as a study strategy and provided practice and discussion following class reading of a chapter subsection on layers of the earth and mineral properties. On Day 2, after a review, the researcher provided keywords for the three major rock types and interactive images of the rock type and its formation. These included: (a) *igneous* rock represented by *Iggy Pig* with a melted chocolate bar (signifying formation from melted rocks), (b) *sedimentary* rock represented by *Harry Centipede* building a brick wall (signifying formation by layers of rocks), and (c) *metamorphic* rock represented by *Netta and More Fish* who placed igneous and sedimentary rocks into a pressure pot over a fire (signifying formation by pressure and heat). Subjects then read two subsections to learn rock types and formations. Each reading was followed by a class discussion of the new information and study strategy.

On Day 3, after a review, subjects read the final subsection followed by a discussion on types of rocks, their formations, and examples. The researcher then read a description of rock and mineral collections as a buffer activity prior to administering the immediate identification test. Two days later, on Day 4, the probed recall was administered, followed by the delayed identification test and study strategy questionnaire.

Notetaking/rereading control group. The control group followed the same procedures but with instruction in notetaking and rereading strategies. On Day 1, notetaking and rereading were introduced as study strategies, with practice and discussion following the first text reading. On Day 2, after review, subjects received guided practice in using these techniques with the second set of text readings. On Day 3, after review, subjects read the final text subsection, listened to the buffer activity, and completed the immediate assessment measure. Two days later on Day 4, subjects completed the delayed probed recall, second identification test, and study strategy questionnaire.

Scoring. Scoring for the immediate and delayed identification tasks included one point for a correct response, with a possible total of 12 points for each test. On the probed recall, 1 point was given for each correct rock formation and for each correct example given, with a possible total of 9 points. On the questionnaire, all strategies were first categorized by common type, then, further subcategorized by helpfulness/use. Similarly, class notes were categorized by common study strategies.

RESULTS

Means (and standard deviations) for the treatment group ($n = 25$) for the immediate identification task were 7.68 (1.82); for the probed recall, 5.04 (2.19); and for the delayed identification task, 6.68 (2.16). For the control group ($n = 25$) means (and standard deviations) for immediate identification were 6.60 (1.44); for probed recall, 3.32 (2.55); and for the delayed identification task, 6.32 (2.70).

Based on separate ANOVA's performed on each posttest measure, statistically significant results were found between groups for the immediate identification task and delayed recall tasks. Subjects in the mnemonic group outscored the notetaking/rereading control on the immediate identification task, $F(1, 48) = 5.41$, $p < .02$, and on the delayed recall task, $F(1, 48) = 6.56$, $p < .01$. On the delayed identification task, no statistically significant results were found ($p > .05$).

The groups reported using different study strategies on the posttest questionnaire. Ninety-six percent of the mnemonic group reported using the keyword method, with 88% finding it an effective strategy; 4% used a rereading strategy with all of these students considering this to be a useful technique. The control group was divided between notetaking and rereading strategies (52%) which they found moderately helpful, and other techniques, including "silly sentences" (the subjects' own label), acronyms, and crossword puzzles (48%), which they found very useful.

Examination of class notes revealed differences in strategies used over the 3 days by the two groups. The mnemonic subjects all used a form of keywords/pictures; the keywords generally rhymed with, or were part of, target words, whereas the pictures integrated both old and new information. The control group used an assortment of study strategies, including traditional notes or definitions, as well as forms of simple prose mnemonics. A close examination of these subjects' class notes revealed many of the "silly sentences" or "silly words" were senseless and were extinguished over time. The control groups' class notes and questionnaire reports reflected an inconsistency between actual methods used and what was reported; the treatment group, on the other hand, was much more consistent.

DISCUSSION

In discussing the results, the following limitations should be considered: (a) use of intact classes at one grade level and with one content area, and (b) use of only a 3-day instructional period, with only 2 days between immediate and delayed testing.

Results of this study support use of keyword mnemonic imagery for recalling content information. Although both groups acquired information through reading and discussion, the mnemonic treatment group significantly outperformed the notetaking/rereading control group on immediate identification and delayed probed recall tasks. Such findings provide further evidence for the growing body of literature on keyword usage by learners varying in age and ability, studying different content information.

Lack of significant results for the delayed identification task may be due to the measure itself. Although the construction of the immediate and delayed identification tests was based on random assignment from a central item pool, there were no alternate forms of the test administered. That is, both groups received the same form of the immediate test and the delayed test, allowing for the possibility of one test being more difficult than the other.

Further, results of the study strategy questionnaires indicate that nearly all mnemonic treatment subjects chose to use the new study strategy over previously acquired skills and found it successful. Based on examples written or drawn by this group, it appeared that these subjects chose to use the researcher-provided images or similar images that they themselves created. Interestingly, almost half of the control group, despite instruction in notetaking and rereading, chose to use another strategy with which they were more familiar. Looking at examples generated by this group, these strategies appeared to be mnemonic in form. Specifically, these notes included the "silly sentences," acronyms, and crossword puzzles which contained the target rock categories in everyday, nonscientific contexts. Although subjects had not been questioned prior to treatments as to their preferred study strategy, it would be of interest in future research on mnemonic imagery to identify previously established study techniques, particularly in light of strategies revealed in the class notes.

It appears that keywords and their mnemonic images can be included as part of regular class instruction on study strategies to aid in recalling content information. Given the lack of strategies found in the review of basal manuals and the need for students to develop such skills, the instructional implications of this study strategy are promising. Future research in this area could address a longer instructional timeframe, as well as transfer to other content areas and with other grade/ability levels.

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STRATEGIES FOR READING EXPOSITORY PROSE

Thomas A. Caron
Eastern Montana College

This exploratory study examines differences in expert readers' use of strategies for reading expository prose varying in difficulty. Previous research in reading strategies (Afflerbach, 1987; Brown & Day, 1983; Collins, Brown, & Larkin, 1980; Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983; Winograd, 1984) has demonstrated that specific strategies can be identified from verbal protocols which characterize the processes readers use to understand expository prose. It is suggested that difficult or unfamiliar prose leads readers to use different strategies to achieve comprehension than are normally used.

The context provided by schema theory in reading (Anderson & Pearson, 1984; Rumelhart, 1976) sets the stage for an understanding of the reading process as an "active-constructive" process (Pearson, 1985) involving a transaction between reader and text (Rosenblatt, 1982). Collins, Brown, and Larkin (1980) discovered that listeners faced with rather difficult text exhibited identifiable strategic responses to text, including forming and revising hypotheses as they proceeded to understand the text. Brown and Day (1983), studying readers summarizing text, identified strategies readers used which seemed to corroborate those previously discussed by Kintsch and van Dijk (1978). They hypothesized that six strategies, including deletion, identification, and construction, constituted sufficient cognitive processing to portray reading comprehension. Van Dijk and Kintsch (1983) demonstrated their restructured portrayal of reading comprehension in which a processing component was addressed. Afflerbach (1987) found that expert readers' approaches to summarizing text changed with its familiarity. Previous research leads to questions about the ways in which readers use strategies in understanding various types of text. The use of innovative research procedures such as think-aloud data collection (Afflerbach & Johnson, 1984; Ericsson & Simon, 1984) also influenced this study.

The importance of understanding expository text in reading to learn at all grade levels, from elementary school through college, makes it essential that teachers understand the relationship between strategies used and reading material. Where particular strategies are instrumental in understanding expository text, the use and nature of these strategies need to be made clear. This study involved expert readers verbalizing their thoughts while reading to summarize excerpts from naturally occurring expository prose which varied through three levels of difficulty. Data consisted of audiotape recordings of these think-aloud sessions that were subsequently transcribed and analyzed to determine the strategies and categories of responses that seemed to characterize the subjects' verbalizations.

The hypotheses addressed were as follows: (a) No differences will be found in frequencies of strategies used between simple and average difficulty expository prose. (b) Differences will be found in frequencies of strategies used by expert readers reading average and difficult expository prose. (Based on previous research, it could be expected that the reading of simple text would lead to higher frequencies in the appearance of unprompted summaries in subjects' protocols. It was also expected that difficult text would lead to an increased frequency of verbalizations indicating progressive refinement and restructuring of gist, as subjects read.) (c) No differences will be found in frequencies of strategies used across four naturally occurring sections of passages as each reader's understanding of gist develops.

METHOD

Subjects

Ten university undergraduates, answering a request for subjects in think-aloud research, were paid $10 each for their participation in this research. None had read the passages used and all scored at least at "grade 14" on a Nelson-Denny reading test (Brown, Denny, & Nelson, 1976). This status constituted criteria for the designation "expert reader" for this study.

Materials

Excerpts were chosen from published articles in relatively obscure journals (Scarf, 1986; Slamon et al., 1986; & Tesley, 1987). These three passages varied from simple to difficult. The order of difficulty was confirmed in two blind tests. Prior to the research, 10 independent judges each placed the passages in order from simple to difficult. Their ordering consistently matched the order used. Each subject after completing the think-aloud readings also placed the passages from simple to difficult, consistently matching the order originally chosen. This seemed to be sufficient evidence that the passages represented distinctly different challenges to the readers. Whether these different challenges led readers to varying approaches to the readings is a simple way to state the purpose of this research.

Procedure

After a training procedure, subjects provided think-aloud data (Afflerbach & Johnson, 1984) while reading each of the three passages. The order in which subjects read passages was randomized by the throw of a die. At four naturally occurring breaks in each passage, subjects provided cumulative verbal summaries. This summary task was used to encourage the subjects to read each passage with understanding. After recorded think-alouds were transcribed, data consisted of three transcripts per subject, or 30 think-aloud transcripts. One half of these transcriptions were analyzed to identify the strategies and categories of response that seemed to be indicated in the subjects' verbalizations. Using a procedure similar to "constant comparision" (Goetz & LeCompte, 1984), six strategies were identified. Subsequent coding of the remaining half of the transcriptions constituted an informal reliability check of the strategy determinations.

The strategies, in order of frequency of occurrence, were as follows.

1. Metastatement: represented by comments or opinions that seem to indicate asides (Kintsch & van Dijk, 1978). These statements are not direct engagements of reader with text, but, seem to be emotionally driven statements about the text, author, or ideas. For example, "Oh, I like this one," or "That's rubbish."
2. Problem-solving: represented by questions, predictions, or inferences. These might be interpreted as attempts to clarify what is being read, indicating or suggesting the existence of an hypothesis about the text. For example, "We'll see if that's true," or, "It's saying that decisions for what we do to patients are based on certain yardsticks."
3. Repetition: represented by a verbalization which is virtually identical with the text.
4. Divergent: represented by a statement which veers away on a tangent from the context of the passage and is generated from the subject's own background or prior knowledge. For example, "It frustrates me sometimes when people give me the impression that I should be embarrassed that I make sure I sleep 8 hours." Although the importance of sleep is suggested by the text, this statement is really framed by the subject rather than the passage.
5. Surface Response: represented by a reference to the reader's own processing that seems evident in a context of surface aspects of the subject's reading. For example, "I'm doing one sentence at a time," or, "I'm looking back to the first paragraph."
6. Surface Structure: indicated by evidence of a subject's being cued or confused by a word or phrase through its understanding or misunderstanding. For example, "Women feel the stress of conflict between home and parenting/between home and parenting/oops/I don't think I understand that."

RESULTS

The six strategies accounted for the transcribed data. Reliability was further verified in an independent blind test in which independent judges categorized a representative selection of statements from verbal protocols using the six categories. Judges' decisions matched with the experimenter's 84.6%, verification that the categories represented reasonably discreet and reliable determinations. Differences in frequencies of strategy use for each passage difficulty level were analyzed using MANOVA (Wilks<.001). To a limited extent all three questions of interest were substantiated by the data. Results appear in Table 1 and are graphed in Figure 1.

Regarding hypothesis (a) the data provided no evidence to reject the null hypothesis, except in the case of problem-solving, which increases in frequency of use from simple to average difficulty as well as from average to difficult. Hypothesis (b) was supported by differences between readings of average and difficult passages in the frequencies of appearance of problem-solving, surface structure, and surface response

Table 1

Mean Frequency × Passage Difficulty

	Passage Difficulty			
	Simple	Average	Difficult	*F*
1. Metastatement	14.9	16.6	23.7	
2. Problem Solving*	6.5	11.1	20.9	<.01
3. Repetition	6.0	7.2	7.3	
4. Surface Response*	2.3	3.3	9.2	<.01
5. Surface Structure*	0.5	2.2	9.5	<.001
6. Divergent	5.6	4.1	1.5	<.054

Note. $N = 10$. *Differences across passages reaching significance ($F < .05$).

categories. As can be seen in Table 1, problem-solving increased in frequency of use in readings of simple to average passages and from average to difficult, surface response frequency of use increased during reading from average to difficult passages, and surface structure frequency of use increased from average to difficult. Regarding hypothesis (c), again, there is no reason to reject the expectation of no differences in frequency of use of strategies as the readers progress through the passages.

CONCLUSIONS

To the extent that hypothesis (a) was not rejected, there was no evidence of differences in strategy use from simple to average difficulty expository text. Frequency of use of problem-solving, however, indicated a different pattern. As found in previous research (Collins, Brown, & Larkin, 1980) the frequency of use of problem-solving, which ought to aid in comprehension, does increase with difficulty of text. This increase seems to be indicative of a greater engagement of reader with more difficult text. However, there also seems to be a qualitative difference represented by questions of text or author that indicate a failure of comprehension rather than greater engagement. Some of the questions and inferences seem to arise out of desperation. For example, "What could this mean?" or "What's he talking about now?" or "This is obviously way over my head!" These "problem-solving"-like verbalizations really do not indicate the subject is becoming more engaged with the text, but probably indicate the reverse, that the subject is losing touch with the text.

Evidence of support for hypothesis (b) was provided by increases in frequencies of use between average and difficult text of three categories: problem-solving, surface response, and surface structure. The increase in frequency of use of surface structure strategy between readings of average and difficult expository text is indicated by a significant increase in puzzled and confused responses to particular words and phrases reflecting that text difficulty is approaching incomprehensibility. The increase in frequency of use of surface response strategy seems to reflect a greater degree of attention paid to superficial mechanical aspects of reading as difficulty of text approaches incomprehensibility. This response does not increase simply as text becomes more difficult,

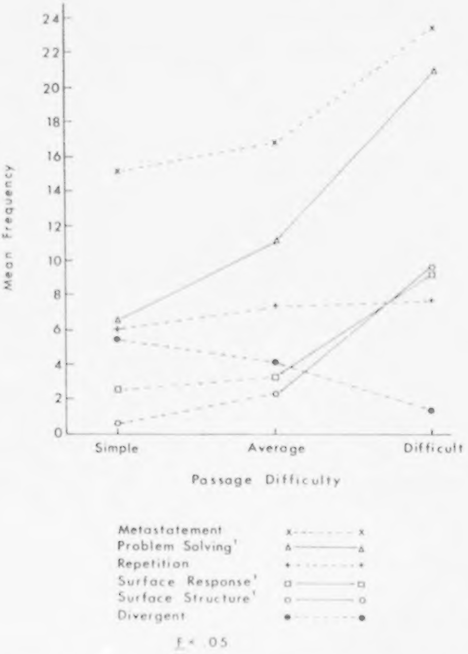

Figure 1. Mean Frequency × Passage Difficulty.

but it is evident when text is so difficult that the subjects are struggling with finding a way to make sense of it. It is of particular interest that these two surface level responses appear as sincere attempts to understand, yet they provide no substantial assistance. In the end no subject is able to make adequate sense of the difficult passage. This suggests it may be of both practical and research value to explore the reasons readers make the choices they do and whether these choices are made in a context of consciously available worthwhile strategic alternatives.

The absence of evidence to reject hypothesis (c) suggests that the subjects in this research did not demonstrate any clear variation in the frequencies of their uses of reading strategies as they progressed through text toward an understanding of the gist of each passage. Further research is needed to explore this question more fully.

The repetition strategy is the only response whose curve is virtually flat, indicating no substantial change in its frequency of use from simple to average to difficult passages. Intuitively one might reasonably expect repetition to be used more frequently as text becomes more difficult. Many readers claim they can understand difficult text more easily if they read it aloud. Many of the subjects in this experiment claimed just this as they read the difficult passage. One reason an increase does not show up statistically may be that readers at first chose to repeat, then proceeded to move more frequently to one of the other responses already demonstrated to be notably higher in frequency. Again it seems that a fruitful avenue for future research might be to identify more clearly the ways that the various responses of a reader interact and otherwise influence each other.

Although differences in the frequency of use of the metastatement and divergent strategy failed to reach significance, divergent strategy differences were close ($F<0.054$). It is particularly interesting that divergent strategy undergoes a reverse trend: there is a decrease in divergent strategy use as passage difficulty increases. This apparent inverse relationship demonstrates that a background of prior knowledge is less available as passage difficulty increases, as can be predicted from the work of Anderson and Pearson (1984). What is of particular note here, however, is the extent to which this prior knowledge base is made evident through the readers' own spontaneous talk. These results suggest the value of discussion both for evaluation and for ongoing comprehension monitoring and the need for research into the interactions of various categories of responses as readers move toward comprehension (see Alvermann, Dillon, & O'Brien, 1987).

What really seems to be important here are the implications this suggests for both research and practice. In a practical context, it is evident that verbalizations such as these may indicate unique learning opportunities. From the point of view of research, it appears that the extent of prior knowledge, as well as various other factors, may lead to a variety of strategic moves and responses. We need to define not only the nature and purposes of these strategic interactions, but also need to understand the context in which these strategic reading decisions are formulated and initiated.

In general, the picture of subjects' processing that is painted by these data is consistent with the hypotheses stated earlier. Strategy use does seem to change with passage difficulty, particularly as subjects find themselves struggling with comprehension. Although the nature of the categories used in analysis do not allow for so formal a statement of relationship as nonlinear, it is evident that the frequencies of use of strategies may not all change in similar ways in response to an increase in difficulty of expository text. Amount and nature of change seem to vary with extent of difficulty. Whether difficulty leads to an increase, a decrease, or no change seems to depend at least on the strategy in question. Research is needed to determine what these changes represent and what it is in the reading experience that seems to influence them. The importance of those relationships to the success of readers at all levels of schooling cannot be overstated.

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INSTRUCTION IN AWARENESS OF CAUSATION AND COMPARE/CONTRAST TEXT STRUCTURE[1]

Donald J. Richgels
Northern Illinois University

Lea M. McGee
Boston College

Several researchers have investigated students' awareness and use of expository text structures in reading and writing. They found students have varying degrees of awareness of structure (McGee, 1982; Meyer, Brandt, & Bluth, 1980; Taylor & Samuels, 1983) depending on specific types of expository text (Englert & Hiebert, 1984; Hague, 1988) and measures used to assess such awareness (Richgels, McGee, Lomax, & Sheard, 1987). Further, they found that text structure awareness correlates with recall.

Researchers have also explored causal relations between awareness of structure and recall in studies teaching students to recognize expository structures. Students trained to write summaries using headings and subheadings recalled more text than untrained students (Taylor, 1985; Taylor & Beach, 1984), but did not write better structured compositions. Students trained to recognize structures in scientific writing, research or journal articles, problem/solution texts, and compare/contrast texts recalled and summarized better than untrained students, but, again, did not write better-structured compositions (Armbruster, Anderson, & Ostertag, 1987; Barnett, 1984; Brooks & Dansereau, 1983; Raphael & Kirshner, 1985).

Few studies have investigated the degree to which instruction improved students' differing kinds of awareness of text structure (e.g., ability to use structure in organizing ideas versus ability to talk about structure). Only main idea/detail, problem/solution, and compare/contrast structures have been used. Finally, there are few descriptions of individual student's awareness of text structure and learning from text structure instruction (however, see Raphael, Kirshner, & Englert, 1988). These issues seem important to investigate in light of the complex nature of students' awareness of structure in various expository texts.

Our study included two phases, one examining students' awareness of and learning about *causation structure* and the other examining students' awareness of and learing about *compare/contrast structure*.

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METHOD

Subjects

All students from the two fifth grades (33 students) and the one sixth grade (25 students) in a rural school in the Midwest participated. Randomly chosen halves of each classroom were assigned, one half to each of two groups, resulting in a group of 30 students and a group of 28. Thus these two groups were equal in numbers from each grade and in numbers taken from each classroom. During phase one—*causation*—the group of 30 comprised the instruction group and the group of 28 served as control. During phase two—*compare/contrast*—groups were reversed. Not all students' data are reported on all tasks due to absences.

Materials

Three awareness measures were used: (a) structure used in written summaries of group discussions, (b) structure (versus content) explanations used in students' interviews about a matching task, and (c) structure used in written recalls of passages read. Because instruction concerned how to write well-organized compositions and included talk about the structure of passages, the first task (written summaries) called for an awareness of text structure most likely to be influenced by instruction. The second task (talk about structure in passages) called for an awareness indirectly used in the instruction. The third task (use of structure in recall) called for an awareness and use of text structure not taught in the instruction but that might be expected to be influenced by instruction. Although our principle interest was awareness, we also included a recall measure: percentages of main ideas and details recalled.

Materials for the task of writing summaries of discussions were two graphic organizers used by the discussion leader to guide discussion. Students did not see the organizers.

Materials for the matching and interview tasks were four-page booklets. One page had two passages written in causation structure and a third passage in a different structure. Other pages had two compare/contrast, two problem/solution, or two collection passages with a third passage in a distracting structure.

Materials for the recall tasks included booklets consisting of four pages of text each followed by a blank page for written recalls. Each booklet contained a causation text, a compare/contrast text, and two texts with no structure (sentences in scrambled order).

Passages in the recall and matching tasks were ones used in an earlier study (Richgels, et al., 1987), and two new causation passages written following the same graphic organizer used for the earlier passages. There were six passages each for causation and compare/contrast structures about topics in social studies and natural sciences. They were 103 to 151 words in length. Each was parsed into idea units; level of importance of ideas was determined with interrater reliability at .91. Additional passages written in collection and problem/solution structures were used as foils on some matching booklet pages.

Passage use was counterbalanced so that each causation and compare/contrast passage was used as often as any other in the various recall and matching roles and with the various treatment and control groups. For each phase of the study, an individual subject read the same passages for pre- and posttest recall, but had different configurations of passages in his/her matching task booklet for the pre- and posttest matchings.

Procedures

All testing and instruction occurred in the spring in daily 50- to 60-minute sessions. In both phases of the study, students were pre- and posttested on all three awareness measures. In each phase, pretesting took 2 days, instruction 3 consecutive days, and posttesting 2 days.

Pre- and posttesting. Students completed the matching and recall booklets on the first day of testing; discussion and summary writing occurred the second day. Students were interviewed about the matching task between its completion and the beginning of instruction. It was not possible to interview all students, nor to have complete control in selecting students for interviews. The recall and matching components of phase one posttesting were combined with the recall and matching components of phase two pretesting. For one, the causation pages of the recall and matching booklets were used; for the other, the compare/contrast pages were used.

For the matching task, students were told to read the three passages on each page of their booklet paying attention to how ideas were organized in the first passage. They were told that one of the other two passages on that page had ideas organized in the same way. They were to circle the passage that was organized or structured like the first passage. Later, students were interviewed individually about their choices on this task. They were not told whether their choices were correct; they were only asked to explain them. The researcher wrote students' explanations. For the recall task, the researcher directed students to read each passage in the recall booklet, to pay attention to how ideas in the passage were organized, and to write all they could remember from the passage.

For the summary writing task, the researcher introduced the topic for discussion (causes of dinosaurs' extinction for phase one and similarities and differences between reptiles and mammals in phase two) and wrote notes on the board from students' comments. The notes were single words or short phrases and were not organized in any fashion. The notes remained on the board and students were asked to write a summary of the discussion. During posttesting, there was no discussion. The researcher wrote the same notes on the board as in the pretest and students were asked to rewrite a summary of the discussion.

Instruction. Instruction followed the steps described in Richgels, McGee, and Slaton (1989). On the first day, the meaning of the word *structure* was introduced using repeated patterns of towers of blocks and cups and repeated sequences of numbers, letters, and musical notes. Then structure in texts was illustrated in two passages about glaciers. These passages were written in collection and causation structures for phase one, and in collection and compare/contrast structures in phase two. The researcher presented an empty graphic organizer (of causation or compare/contrast structure) and then presented the same organizer with ideas from the glacier passage. A last graphic organizer containing ideas from a passage the students had not read was presented. For causation, this passage was taken from a fifth-grade social studies text about the causes of the War of 1812. For compare/contrast, the passage was from a science book comparing Earth and Mars. The researcher and students discussed the ideas in the organizer.

On the second day of instruction, students placed ideas from the glacier passage into an empty graphic organizer. As a class, they dictated a composition about glaciers using only their graphic organizer. Finally, the graphic organizer about the causes of the War of 1812 (or about Earth vs. Mars) was reviewed paying particular attention to relations among ideas and clue words signaling those relations. Then students wrote compositions using that graphic organizer. We will refer to these compositions as the *during instruction* compositions. They were used as indicators of how well students were learning from the instruction.

On the third day, students' compositions were returned to them. The researcher guided a discussion comparing students' compositions to the graphic organizer. Students then saw the War of 1812 or Earth/Mars passage for the first time. They read and compared it to their own compositions. They discussed characteristics of the causation (or compare/contrast) structure and clue words which signaled that structure.

Instruction was given twice in each phase, once to the fifth graders and once to the sixth graders in the treatment group, with a single instructor (one of the researchers) using the same lesson plan both times. While a treatment group received instruction, their grade level cohorts in the control group accompanied a classroom teacher to another room for their usual instruction.

Scoring

Two scoring scales for rating compare/contrast and causation structure in recall, discussion summaries, and during-instruction compositions were developed for the study based on scales used in previous studies (Meyer, et al., 1980; Richgels, et al., 1987).

The maximum *causation structure* score was 13. This score included two components: a score for organization and a score for number of causal words explicitly stated linking two related ideas. The maximum score for causation organization was 7. This score reflected appropriate use of the causation structure from the recall passage or from the discussion and graphic organizer used to generate during-instruction compositions (three hierarchical levels of importance and causal words linking ideas between and among these levels). However, the passages, discussion, and graphic organizer included more causal words than the minimum number required to receive an organization score of 7. Therefore, 6 additional points were possible for inclusion of causal words explicitly linking related ideas. A causation structure score of 8 or greater (out of 13) was considered an indication of strong awareness and use of structure. A causation structure score of 8 required students to use three levels of importance and some causal words linking ideas between those levels.

The maximum *compare/contrast structure* score was 8. This score was based on three hierarchical levels of importance and explicitly stated comparison or contrast words linking ideas between and among those levels. (No other compare/contrast words were included in the recall passages or discussion so no additional points were possible in this phase). A compare/contrast structure score of 6 or greater (out of 8) was considered an indication of strong awareness and use of compare/contrast structure. This score required students to include ideas from three levels of importance and at least some explicitly stated comparison words.

Interrater reliability on rating students' compare/contrast and causation structures in discussion summaries and during-instruction compositions was .93.

Explanations given in the interviews were scored in four categories: structure explanations (reasons based on the structure of interest), other-structure explanations (based on some other structure), content explanations (based on ideas in the passage), and other explanations (e.g., "I don't know," "My conscience told me to").

RESULTS

Phase One: Causation

The mean structure ratings (and standard deviations) of the instruction group's discussion summaries were: pretest—5.89 (2.54); posttest—6.60 (2.39). For the control group they were: pretest—6.63 (1.66); posttest—6.54 (2.30). An analysis of variance showed no statistically significant effects for group, time, or group × time. The during-instruction compositions of the instruction group were also scored for structure ($M = 7.07$; $SD = 3.55$). An analysis of variance showed no statistically significant differences among the instruction groups' pretest summaries, posttest summaries, and during-instruction compositions.

During the pretest interview, no student in the instruction group (of 16 interviewed) gave structure explanations, whereas 4 students (of 22) gave structure explanations in the posttest. None of the control group students (of 18 interviewed) gave structure explanations at pretest, while 2 students (of 20) gave structure explanations in the posttest. A chi-square analysis showed no significant differences.

A preliminary examination of written recalls showed that most students wrote too little to warrant the structure analyses that were possible with discussion summaries. Most of the written recalls lacked an apparent structure; many were lists of words or phrases or were single sentences. The percentage of recall for pre- and posttest for the instruction group was 25.63% and 23.79%. The percentage of recall for pre- and posttest for the control group was 24.19% and 24.07%. There was not a statistically significant interaction between group and time. There was a statistically significant effect for level of ideas, more main ideas being recalled than details across groups and times, $F(1, 46) = 4.21$, $p = .046$.

Phase Two: Compare/Contrast

The mean structure ratings (and standard deviations) for the instruction group's pre- and posttest discussion summaries and during-instruction compositions were:

pretest—4.32 (1.86); posttest—5.76 (2.31); during-instruction compositions—6.84 (1.57). For the control group they were: pretest—4.53 (2.01); posttest—4.80 (2.27). An analysis of variance using only the pre- and posttest data showed statistically significant effects for time, $F(1, 53)=9.98$, $p=.003$, and for group × time, $F(1, 53)=4.74$, $p=.034$. Looking only at the instruction group and including during-instruction compositions, an analysis of variance and Tukey post hoc analyses showed they were better at using structure during instruction and at posttest than at pretest, $F(2, 248)=15.63$, $p=.0001$.

During the interview pretests, 7 instruction-group students gave explanations based on compare/contrast structure (of 17 interviewed) whereas 11 gave structure explanations at posttest (out of 23). During the pretest, 5 control students (of 17) gave structure explanations and 9 students (of 22) gave structure explanations at posttest. A chi-square analysis showed no differences.

As with causation, compare/contrast written recalls were not analyzable for structure. The mean percentages of ideas recalled by the instruction group were 18.57% at pretest and 25.14% at posttest. The mean percentages of ideas recalled by the control group were 22.98% at pretest and 27.48% at posttest. There was not a statistically significant interaction between group and time. There was a statistically significant effect for level of ideas, more main ideas being recalled than details across groups and times, $F(1, 49) = 32.85$, $p = .0001$.

DISCUSSION

Results suggest our writing-based instruction was more effective when teaching compare/contrast structure than causation structure. For the compare/contrast structure, instruction was more effective in influencing students' use of structure in discussion summaries than their use of structure to talk about or recall passages. However, we were interested in more than what statistical tests and group data revealed. We were interested in individual student's awareness of text structure and responses to instruction.

One explanation for the difference between the compare/contrast and causation instruction may be related to students' initial levels of awareness of those text structures. Prior to instruction in both the instruction and control groups, a number of students wrote pre-instruction compare/contrast summaries with strong structure ratings and began the study by being able to talk about compare/contrast structure in interviews. In contrast, fewer students in either group wrote pre-instruction summaries with strong causation structure ratings. None of either group used causation structure talk in their prestest interview explanations.

Another explanation for the difference between compare/contrast and causation instruction may be related to students' performance on during-instruction compositions. For compare/contrast instruction, nearly all students' during-instruction compositions indicated strong awareness and use of structure (22 of 26 students). For causation instruction, only 11 of the 26 during-instruction compositions were rated as indicating strong use of structure. This difference is all the more striking when one considers that instruction groups wrote their during-instruction compositions from a graphic organizer shown on an overhead projector.

A problem with the compare/contrast treatment was getting transfer to posttest discussion summaries; many students who wrote poorly structured summaries at both pre- and posttest had written well-structured compositions during instruction. A problem with causation treatment was that instruction was ineffective in teaching students to use the structure at all. Three of the 11 students who wrote good during-instruction compositions had written well-structured pretest summaries, leaving only 8 students (out of 20) who were taught to use the causation structure by relying on a graphic organizer.

Few students showed awareness performance in both the summary and interview tasks that was consistent with their learning during instruction. Only 2 in the causation phase who wrote well-structured during-instruction compositions also wrote well-structured summaries and gave causation explanations at posttest. Neither of these students performed well at pretest (indicating they had little knowledge about causation structures before instruction began). In the compare/contrast phase, 7 students wrote well-structured during-instruction compositions and also wrote well-structured summaries and gave compare/contrast structure explanations at posttest. Four of these students performed well at pretest, leaving only 3 who were taught to use structure both in writing summaries and talking about passages.

A surprising result was the number of students whose interview explanations were based on another text structure that they perceived. Many spoke of structure in terms of topics (or main ideas) and details, in terms of lists (giving special attention to sequence words such as *first, next,* and *finally*), and even in terms of problems and solutions. Frequently such explanations occurred at both pre- and posttesting (even though students read different passages in the pre- and posttest matching booklets). Thus, some subjects brought to the study a robust structure awareness and accompanying vocabulary that were not the same as what we attempted to teach.

The results seem to suggest that causation is a less known structure and a more difficult one for students to learn than compare/contrast. This is consistent with the findings of Richgels et al. (1987). Nonetheless, other explanations for students' learning better from the compare/contrast instruction are possible. It is possible that its effect was due to the causation passages being more complex than the compare/contrast passages. Although passages written in both the causation and compare/contrast structures included ideas on three levels of importance and words (causal or comparison) linking ideas between and among levels, the causation passages included more linking words. Therefore, ideas in the causation passages were more interrelated than those in the compare/contrast passages. Although we could not directly compare structure scores for causation and compare/contrast, the scores indicating strong use of structure required students to use structure equally (use the same three levels of importance and the same number of words connecting ideas between and among the same levels of ideas). Using this measure, fewer students' writings indicated strong use of structure in the causation phase. Another indication of students' lack of awareness of causation structure was their inability to detect and talk about this structure in the matching and interview task. Twenty-three students in the study gave compare/contrast explanations in either the pre- or posttest interviews (or both) whereas only 4 students gave causation explanations. Still, the causation passages' greater interrelatedness may make detecting and learning the causation structure used in this study more difficult.

A second explanation for compare/contrast's effects may be its being in the second phase of the study. There was only one instructor, and although he followed the same steps in both phases, there was no control for his gaining experience with the method of instruction. Another possible explanation is that the instructional example passages and topics for during-instruction compositions might have been more appealing in the compare/contrast phase than in the causation phase (similarites and differences between Earth and Mars as opposed to the causes of the War of 1812). We did not test for prior knowledge or interest although we used several passages on a variety of topics in recall and matching tasks to counterbalance for these. Still, inconsistency in results from the awareness measures to the during-instruction performances might be related to differences in passage content.

Several aspects of the study raise questions for further investigation. During instruction, the students talked about structure and easily located "clue words" that signal types of expository text structure. They used these words to link ideas in their oral discussion guided by graphic organizers. Yet, especially in the causation phase, they seemed unable or unwilling to repeat such talk in interviews or explicitly to include such language in their compositions. More research is needed that examines how students use their knowledge of structure during reading or writing of texts. Think-aloud procedures may provide valuable insights into students' use of text structure as they process text. Such procedures may allow researchers a better understanding of what students perceive of as structure in their own reading and writing and how these notions guide reading and writing. What researchers and teachers perceive as salient structures in expository texts may be quite different from what students perceive (Langer, 1986).

We were unable to use students' written recalls as structure awareness measures, and we found no statistically significant differences between pre- and posttest percentages of ideas recalled by instruction groups. The instruction was quite brief and no attention was given to explicitly using structure in reading—although the students read several passages looking for structure as a part of the instruction. Instructional activities requiring students to move from using a written and completed graphic organizer for writing to using an imagined graphic organizer during reading and recall might facilitate transfer to recall tasks.

Another aspect needing further investigation is that there were few instances of an individual student's profile showing consistency from task to task. Although group means showed that the instruction group benefited from learning about compare/contrast structure by being able to write better organized discussion summaries, the patterns of results from individual student's pre-, post-, and during-instruction writings and from their pre- and post-instruction interview responses were not always consistent. Further research examining individual students' responses to and understandings of text structure instruction is needed.

Limitations of this study include being generalizable only for fifth-and sixth-grade students and only for short passages reflecting a single text structure like those used in the study. Students seldom encounter such pure passages in their textbooks (Schallert & Tierney, 1981). Research is needed about students' comprehension of texts that are more natural than those used here but that, nonetheless, reflect authors' considerate decisions about the relation between content they wish to convey and text structures they use.

CONCLUSION

This study demonstrated greater initial awareness of compare/contrast than of causation text structure among its fifth- and sixth-grade students. Furthermore, instruction was more effective for compare/contrast. Text structure instruction may be even more effective when combined with other kinds of opportunities and experiences with writing. Students in this study wrote only first-draft summaries and compositions. Given that knowledge of structure may also affect revision (Flower & Hays, 1980), students who resemble our study's subjects may learn about and use structure more effectively as a part of revising compositions or recalls.

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MULTIMEDIA AND MULTILAYERS IN MULTIPLE TEXTS

René Galindo, Robert J. Tierney, and Laurie Stowell
Ohio State University

The present study investigated the influence of multimedia texts on student's ideas of author, reader, and text relationships, and on the influence of multimedia texts on student's learning. Recent innovations in computer technology have made it possible for users to compose multimedia texts on personal computers. These multimedia texts operate within a hypertext environment in which written text, static and animated graphics, and color video can be linked together.

BACKGROUND TO THE STUDY

Hypertext has been defined by Yankelolvich, Meyrowitz, and van Dam (1985) as nonsequential reading and writing that is both an author's tool and a reader's medium, and further by stating that "a hypertext document system allows authors or groups of authors to link information together, create paths through a corpus of related material, annotate existing texts, and create notes that point readers either to bibliographic data or to the body of referenced material. Hypertext can allow the creation of an automated encyclopedia of sorts: readers can browse through linked, cross-referenced, annotated texts in an orderly but nonsequential manner" (p. 18). Building on the word hypertext, these authors use the word *hypermedia,* "to denote the functionality of hypertext but with additional components such as two and three-dimensional structured graphics, paint graphics, video, sound and animation" (Yankelovich et al., 1985, p. 18). With hypermedia authors can make links to the graphics, text, video, and animation that are part of the document.

The software *Hypercard* provides graphic and text tools with which one can compose textual as well as draw graphic information. Hypercard provides the user with an easy-to-use programming language called *Hypertalk* that can create links between units of information. The program is then connected to a "button" (a button is a graphic image on the screen that can vary in size and appearance) a reader can use to activate those links. Hypercard can also be easily programmed to play selected portions of video on a video disk player. We will be using the term hypermedia throughout this paper since the Hypercard text incorporates other media besides text. The multimedia texts used in the present study were created by high school students using Hypercard.

Landow has discussed the impact that hypertext can have on the relationships between author, text, and reader (Landow, 1989). He suggested that hypertext has the power to change the way we understand and experience texts because hypertext emphasizes connections and relationships between texts. Landow states that texts "situate themselves within a field of relations, most of which the print medium keeps out because the referenced (or linked) materials lie spatially distant from the reference" (p. 123). Hypertext systems have the capability to make the complete text or portions of the related texts readily available. The reader can move quickly between the main texts and related texts. Landow suggests that this changes readers' relations to the set of texts and changes both the experience of reading and the text being read. Kristeva (1978) has called the set of relations that a text has with other texts, "intertextuality." She based the concept of intertextuality upon Bakhtin's (1981) ideas that every utterance is in relation to previous utterances and that the utterance also anticipates its relation to future utterances. Hypertext emphasizes intertextual relationships by highlighting the connections that exist within a document and with related pieces of writing.

Landow's (1989) research examined college students' use of a hypermedia system called Intermedia. Throughout his teaching experience Landow had noticed that inexperienced students failed to make use of supplementary information material such as glossaries, footnotes, or introductions. The students in Landow's study made greater use of those resources after their experience with Intermedia. He concluded that this greater use resulted from experiences with Intermedia that encouraged the students to create and perceive connections between related units of information.

The designers of Intermedia have also suggested the potential of hypermedia to redefine the relationship between the author and reader, calling their system "seamless" because it makes no distinction between the two. Yankovich et al. (1985) state that "Authors and readers should have the same set of integrated tools that allow them to browse through other material during the document preparation process and to add annotations and original links as they progress through an information web. In effect the boundary between author and reader should largely disappear" (p. 22). In accordance with this view, Landow (1989) uses his student's use of Intermedia to provide examples of the movement between reader and author. The college students in his English classes made contributions to the Intermedia document that they were reading and those contributions became part of the Intermedia materials. In particular, the students reading Intermedia added graphics, text segments, and annotations. They also commented on each other's annotations and made suggestions of possible sources and directions for research on different topics.

The nonlinearity inherent in hypertexts allows the text to be organized along multiple dimensions. As Landow (1989) points out, the reader's interest can serve as an organizing principle for the investigation at the moment. Readers can experience the same texts along varying dimensions of organization according to their interests at the time of reading. Esther Dyson (1987) says that "hypertext includes the notion of webs, or an individual's idiosyncratic view of a particular set of information nodes . . . . A psychologist will see one set of connections in a child's fairy tale; a social historian will see another; and the child will see yet a third" (p. 86). The multiple dimensions of organization allow readers to have shifting vantage points on the text. In examples taken from Intermedia, Landow (1989) showed how a student could read a text by following an organization according to the author's works, by historical periods, or by genres.

The affect of sequential or nonsequential access to information on learning in hypertext environments is currently being studied by Ragland (1987). Ragland points out that there are many unknowns with respect to learning from hypertext documents. Although a major assumption of hypertext is that learning rates increase by letting users control the sequence of information access, this assumption is still open to argument because the manner in which linear or nonlinear sequential access of information affects comprehension or recall has not been extensively researched.

Weyer (1988) has also addressed issues related to multimedia, learning, and hypermedia systems. Weyer calls for hypermedia systems to be developed that will allow fundamentally new organizing principles for knowledge and new navigational and manipulation tools for the learner. He reminds us that the life experiences in which our learning takes place involve a variety of media (e.g., tactile, visual and auditory modalities all play important roles in our learning), pointing out that the multimedia nature of our world is not well represented in static print text. He suggests that a multimedia perspective must not only change the manner in which we represent content but also must change the way that we present and organize that content. It also needs to account for the decisions necessary to know how multimedia can be best used to explain a principle or set up a conceptual framework for an area of study.

Multimedia makes it possible to represent phenomena in a variety of ways. Those multiple representations aid the learner by providing unique and complementary information about the object being studied. Pea (1987) says, "Hypermedia may dramatically enhance processes and outcomes of teaching and learning by making it possible to choreograph the display of multiple representations of phenomena, events, or concepts, and to provide semantic links between multimedia works" (p. 80). The links that Pea mentions work to establish connections between related ideas. The graphic authoring tools available to the user introduce a visual dimension to authorship. Pea says that hypermedia tools can provide highly motivating incentives for learning. The reader can be involved in multimedia design/composing rather than only reading/browsing. The static and animated graphics of hypermedia bring aspects of visual design and composition into the authoring process that are not present in print texts.

PURPOSE

The present study grew out of the aforementioned claims made about hypermedia and their pedagogical relevance. In particular, our interests were twofold. How does Hypercard affect reader-author-text relationships? And, in what ways might the multimedia texts of Hypercard influence learning? To answer these questions, we pursued interviews with student users of Hypercard drawn from an intense computer environment in an urban midwestern high school. These students each had a computer at their desk for half of the school day and also had a computer at home on loan from the school. The students were adept at word processing and other computer applications and had been introduced to Hypercard 2 months prior to our study.

METHODOLOGY

Data Collection

As part of their biology class in a computer intense environment, 10th-grade students developed a study guide based on a chapter from their biology book using the Hypercard software. Pairs of 10th graders chose a chapter from their biology text and developed the study guide from the content in the text, using the capabilities of the Hypercard software. The 10th-grade students had also been in the computer class during 9th grade. Four 9th-grade students who had previous experience composing with Hypercard were interviewed regarding their use of the 10th-grade biology study guides.

Individual interviews were conducted with the four 9th-grade students (referred to as Student A, B, C, and D in the remainder of the paper). Student A (Southeast Asian female) came to the United States when she was 9 years old. The computer classroom was her first experience with computers. Student A enjoys reading and writing at home. Her out of school writing is confined to a personal notebook where she writes about her painful experiences in Southeast Asia. Student B (white female) enjoys reading literature and writing poetry. Some of her poems have been published in school publications. She had limited contact with computers in middle school. Student C (white male) has been working with computers at home and at school since third grade. He is particularly interested in computer graphics. Student D (black male) had limited contact with computers in middle school and he had difficulty learning how to use the computer in the computer classroom. He was not as comfortable using computers as his classmates.

In the first part of the interview the students were asked how they would study the biology chapter and then the Hypercard study guide for a test. This was followed with observations of their behavior as they studied the same information presented in Hypercard and in a biology text. In the second part of the interview the students were asked what they thought were the advantages and disadvantages of the biology and Hypercard study guide with respect to studying. In the third part of the interview, the students were asked to compare writing with Hypercard with writing a traditional written assignment.

Data Analysis

The analysis was driven by the following questions. First, what is the nature of author-reader-text relationships across the two types of representations of information: a regular textbook and a Hypercard text? Second, what were the student's learning strategies for Hypercard as contrasted with those used with the regular text? To that end we pursued two overlapping analyses of the transcripts of the interviews.

To assess the nature of the student's learning strategies, student comments and behaviors were examined for evidence of the planning they pursued and the procedures enlisted with respect to meaning-making involved in reading and writing. Specifically, the students' plans were analyzed in terms of whether they were self-driven or text-driven.

The interview data were also coded for author-reader-text relationships. In particular the students' comments were coded along four dimensions, *author to text, author to reader, reader to text,* and *reader to author*. These categories were chosen to organize the analyses, but were not taken to be mutually exclusive. The categories *author to text* and *author to reader* examine issues related to the author's relationships to the text and to the reader. The categories *reader to text* and *reader to author* examine issues related to the reader's relationships to the text and to the author. Tables were devised that organized and displayed the data so that comparisons between the learning decisions of the informants could be made. Comparisons between the students as readers and as authors, with regard to their purposes and procedures in working with a textbook and Hypercard, were charted.

RESULTS

From Author to Text

It has been suggested that multimedia texts provide authors opportunities for new ways of presenting information and at the same time call for new organizational and navigational tools for those texts. Working with multidimensional texts in Hypercard did appear to help the students we interviewed think of alternative ways to represent the information they authored. Two students made reference to presenting information in other than standard print formats. Student A said "There were other ways to present ideas" and that those different ways could be more interesting to the reader. This student also said the graphics and text fields could be used to appeal to the reader and interest him in the text, stating that "you have, like those pictures and those little text fields that you would tell about the subject that you're doing. It just catch the attention of the reader, you know. You look at it and you want to read it. But like in paper and pencil you just look at it and you say, 'Oh it's just another piece of writing,' you know. But Hypercard really makes your subject interesting." Student B said,"Instead of just thinking of a textbook you think, 'Well, it could be this way' and you look at a screen instead of a textbook." The students' experiences with Hypercard appeared to help them think about alternatives to standard print texts and how the unique features of Hypercard can be used to create alternative types of texts.

The majority of students had no difficulty working with Hypercard. Only Student D found the different kinds of tasks involved in composing in Hypercard difficult. He was familiar with the task of going to the library and doing research to write a report and the new tasks presented by Hypercard seemed to be more work: "With a written assignment you go through the book, you go to the library and find other information. With Hypercard you have to draw pictures, you have to make buttons, you have to keep going to different stacks, if you have to draw a picture you copy it from a stack, add something to that, it takes alot more time . . . . I don't like it because some parts of it I don't understand. I can't do all that other stuff." Even though he found it difficult, he still felt the Hypercard text was better because, "Hypercard makes it a whole lot easier, well, not easier but a whole lot better, than just having to write it out and draw graphs and draw pictures. It makes the pictures better; you can even make the computer talk." Student D realized the potential existed for the Hypercard text to make use of voice even though up to that point only a few students had experimented with voice in their Hypercard texts.

From Author to Reader

Nyce (1987) has studied how people create and use hypertext systems. In particular, he is interested in the fact that conventions for hypertext have not been fully established. As he stated, ". . . how knowledge should be represented and created in hypertext remains an open question" (Nyce, 1987, p. 186). This lack of conventions also emerged in our interviews. Several students were not sure of how to move on the next card as they were using the Hypercard study guides. These study guides did not use scrolling (as in word processing documents), but instead the reader moves between "cards" of information by clicking on "buttons." Because there is wide variation in the appearance and location of buttons, the reader does not always know where to click the mouse to move to another card. Therefore the students often clicked on several parts of the screen until they found the buttons. To take the reader into consideration, one student in our sample directly addressed the lack of conventions in the location and placement of buttons by marking the buttons on the Hypercard texts that he had authored. Next to his buttons the student had written, "click here." Some student-authored study guides also contained typed directions on their cards. Those written directions included such things as "click on the boldfaced word to see it's definition."

Besides clarifying some of the conventions they were using, the consideration of the reader by the author also appeared when the students mentioned the use of the features of Hypercard as part of their rhetorical strategies. Various features of Hypercard (such as buttons and animated graphics), along with the content of the text, were integrated to present a text that not only contained the content information but that also presented it in a manner that the author thought would engage the reader. Student A said, "And you can just flash little messages that people would read, you know; you flash something and they would read it right away. You use the information that you have and then you show it bits by bits, you know, little by little, so that you would catch the reader's attention." The authors also presented the information in chunks that would be manageable for the reader: "on the screen you wouldn't have to read so much and what you read you take in fast. In a biology text you just look at it and there's so much." From an author's perspective, Student A was concerned with how to use the medium of Hypercard to present the information to the reader.

From Reader to Text

The set of navigational options in Hypercard available to the reader presents opportunities to make choices and decisions about the manner in which the reader moves through the text and whether the reader looks at the related information. Readers can choose from among those options or they can set up their own. Readers' initiatives play a key role in defining the organization of the text and the sequence in which they access information in the text (E. Dyson, 1987; Landow, 1989). As readers move through the text they make decisions and choices about which of the routes they will follow. Student C commented on being able to interact with the text as he made those decisions by saying, "You get to move the mouse around, more than just sitting back with the textbook." Student B also commented on the active participation of the reader by saying, "I think you learn more when you use it instead of just reading about it, because you're more into it."

The nonlinearity of the Hypercard text makes the access of information more efficient. The reader is able to access information quickly by making use of the computer's extremely fast search and find capabilities. This feature is especially helpful when dealing with informational text. Readers can find the specific information they are looking for very quickly. The majority of students commented on the fast access of information that is available in Hypercard. Student B compared the access of information in Hypercard with that of the textbook. She said, "If you want to know something you just hit like 'command F' or something and you type in what you want and there it is. Then in a textbook you have to go through the index and then you have to look here and if its not there then you have to go back." The nonlinear movement through the text was useful not only in finding information but also in navigating through the text. Student C said, "if you want to skip something you can do it easier."

Although Hypercard facilitated more flexible access, the students' lack of experience with Hypercard resulted in uses of the study guide that appeared to be less thoughtful. They seemed to have difficulty articulating a "plan of attack," in sharp contrast to their ability to articulate a plan for use of the biology text. In the latter case, all students were able to articulate their own plan, stating that they would follow the linearity of the biology text, studying the chapter from the beginning and moving towards the end. Conversely, Student D, for example, had difficulty knowing how to begin moving through the study guide. He clicked all over the first card to find a button to begin and when Student B was asked why she chose to start with green algae, she replied, "Because it's my favorite color." In response to the researcher's query about what he would do first on the study guide, Student C responded, "I don't know, just study. Pick 'em out and go one by one." When the researcher probed by saying, "Is there a method to how you would go about studying this?" he responded flatly, "No." Student A's plan was similar to Student C's. Since she had no definite idea of how to begin, she said, "First I would go and read all their information about algae." She also said, "I think you would have to read the chapter first, you know, to know the background of algae. If you go right away and study in Hypercard, I think you would be a little lost." The students' strategies for a textbook appear to be more tied to the linear access of information of a book and the students' trial and error attempts with the study guide may have been due to their lack of experience with the nonlinear access of information in the study guides.

The shift in the organization of information suggested by Weyer (1988) was evident in the manner in which the relationship between graphics and text was modified by the authors of the Hypercard text. The ability to incorporate multimedia in the Hypercard text gave the authors the flexibility to adapt the information contained in the biology book and to present that information in a very different type of text. The task of "translating" information from a textbook to a more dynamic text called upon the student authors to consider the strengths of each type of media and to determine what content could be most beneficially presented in each type. Two ways in which the content of the biology book was adapted was through the use of animation and through redefining the role that graphics played in the text as a whole. In the biology book the graphics played a secondary role to the text. The biology book used many color photographs and black-and-white diagrams but they were usually placed in the margins of the pages and the text occupied the central part of the page. On the other hand, in Hypercard the graphics played a more primary role (especially in the use of animation). The text and graphics were more evenly distributed on the card. Because the authors were working with a limited amount of space on a card, they summarized the information from the biology book. These summaries along with the redefined relationship of graphics to text made the Hypercard texts very useful for studying. Student A said:

> In Hypercard most of the information they take out is short and very informative. They have details but details that really help you understand and they also have the main part that you would have to know. And in books, they have it, sometimes I think that books just take up space you know they add anything between the lines of the main idea but in Hypercard they pick out the main part.

Student C commented on the usefulness of the integration of graphics and text into Hypercard: "You just have it all in one place, you click it and make it like a whole set up just on one page."

Along with static graphics the Hypercard texts also made use of animated graphics. The importance of animation to portray an organism's movement in biology was mentioned by Student B: "The book doesn't move and it can't animate. You just look at it and it don't tell you much . . . the book might say this is how it does it . . . but when you see it actually do it, its much easier." Student A also talked about the importance of animation in learning. The example she used showed movement as an important identifying characteristic of an organism: "If we were studying a diagram of the bloodstream or anything like that they can show the flowing of the blood, I mean in a book they wouldn't have that."

One other example of media used with Hypercard was color video. The video disk player was hooked up to a color monitor and placed next to the Macintosh computer. The video added the important dimension of color to the text. That this dimension is important was pointed out by Student A, who said:

> In Hypercard they don't have no colors so you can't identify like if it was a chlorophyll . . . in a book you would see right away, the green round stuff was chlorophyll. And then in Hypercard you would have to figure out or see the words that they have at the side.

The use of the video along with the other media in the Hypercard text combined to give the reader a variety of media to use in learning about the content. Multiple representations can be useful for learning when they are choreographed to provide links between units of information that are meaningfully related (Pea, 1987). Student B commented on the complementary role of the variety of media by saying, "If you don't understand what this is (the information on the computer) or you don't understand what it's doing (animation), you look up there (to the video) and you can understand it better. Or it could be the other way around." The features of animation and color video not only serve to make the Hypercard text dynamic and multimodal but also played an important role in students' learning.

From Reader to Author

The students in our sample were sensitive to the author's tasks in composing in Hypercard because they also had been authors of Hypercard texts. Those latter tasks included programming to accomplish such things as animations and links between units of information. Students were unaware of who specifically had authored the Hypercard study guides they were viewing but knew that it was someone in one of the high computer access classes. Student B made a comment about the author of the guide as she was reading saying, "Mr. Stevens must have had some fun," relating the Hypercard text to a presumed author, her science teacher. The guide had actually been created by a team of 10th-grade students. The students' experiences as authors of Hypercard gave them the knowledge of the authoring tools used with Hypercard. That perspective gave them the opportunity to read Hypercard through the eyes of an author. Student B commented on this when she said, "When you work with it you have an idea of how they're doing it and that makes it a little more interesting. 'Cause its like, 'Oh, I wonder how they did the script for this thing?' "

When making decisions with regard to what was presented, the features of Hypercard were most useful for presenting information in an interesting fashion. "In Hypercard you can just present it, flash it out and show it. It's real interesting. I think Hypercard really helps get the attention of what you're presenting" (Student A). Being authors and readers of Hypercard may have made the students more sensitive to ease of use and possibly more conscious of an audience. "When we did our project we wanted it to be easy for the people who didn't know how to use it" (Student A). Student D concurred by saying: "I tried to make it as easy as possible so people would know where the buttons were. I had buttons that told you where to click."

DISCUSSION

One of the questions guiding our research was how the multimedia texts of Hypercard influenced learning. These multimedia texts provided rich and complex resources for students' learning. Two students commented on the importance of multimedia for learning. They specifically mentioned the important contributions that animation and color video can make to the learning of biological content. One student mentioned the triangulation possible through multimedia. She said that if she could not understand the information through one medium that another would provide additional information that might help her understand. It appears that multimedia did help the students learn about the biology content by providing multiple sources of information, many of which, like video and animation, would not be found in a book.

The multimodal nature of these texts makes one think of those described by Dyson in her research with young children (A. Dyson, 1986). The young children in her study incorporated drawings, gestures, and written language into their composing process. The children made use of the meanings made possible through those multimedia and integrated them into their text. As the children progressed through school their texts became less multimodal and they made more exclusive use of written text. Hypercard gave the high school students tools with which to compose multimedia texts. Unlike the crayons, paper, and pencils of young children, the tools of hypermedia are electronic. Dyson's research with children shows us that narrow definitions of writing did not account for the multimedia composing of children. Hypermedia brings multimedia composing to older students and one can wonder if an eventual widespread use of hypermedia systems will expand the manner in which we define composing for older students and adults. The results of the present study suggest that it might.

The other question guiding our study was whether the software, Hypercard, had an impact on students' ideas of author-reader-text relationships. In terms of authorship there seemed to be at least four factors contributing to authors of Hypercard being sensitive in ways authors of regular text may not. First, the lack of textual conventions in hypermedia that other researchers have pointed out was also evident in our study. It appears that the need for more explicit directions in Hypercard might necessitate that authors be more sensitive to the reader-user. Hypermedia provides a unique opportunity to study the development of textual conventions. Second, the relationships between author-reader-text are influenced by the multimedia used to present and organize information for the reader. Several students mentioned that the presentation of information was important not only for learning but also for the engagement of the reader. Third, Hypercard requires that authors remain aware that a reader has options. In particular, Hypercard texts are established to allow readers the possibilities of moving between layers of text. Whereas the presentation of ideas in regular text may regiment a reader's response, authors and readers of Hypercard recognize a variety of different pathways through a topic. A question left unanswered in the present study is whether students can effectively manage these options or what needs to be in place so they can. Fourth, students working with a regular text seemed less involved in selecting and summarizing, whereas students working with Hypercard seem more involved in those aspects of writing. As a result, the Hypercard texts used in the present study may have sponsored a more factual orientation to ideas as a result of summarization.

CONCLUSION

This exploratory study contributes to the small body of research currently available on students' use of hypermedia by investigating the impact of hypermedia on students' ideas of author-reader-text relationships and the impact of hypermedia on students' learning. The students' comments indicated that their experiences with Hypercard appear to have helped them think about alternative ways to present information, to think about the role of multimedia to engage interests and to efficiently provide information to the reader, and to consider the usefulness of multimedia in aiding learning by portraying important characteristics of the topic.

Landow (1989) points out that hypermedia provides a rich means of testing hypotheses about the influence of different kinds of texts on author-reader-text relationships. Hypermedia provides such a vehicle because it emphasizes certain characteristics common to print texts and highlights those characteristics (such as intertextuality). Hypermedia's importance to people interested in reading and composition may be in its use as a comparative base with which the reading and writing of print texts can be compared and as a vehicle for studying communication, including whether Hypercard affords a more dynamic interchange between author, reader, and ideas.

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OVERCOMING PROBLEMS WITH INCORRECT PRIOR KNOWLEDGE: AN INSTRUCTIONAL STUDY

Nancy Marshall
Florida International University

This study is one of a series developed to investigate the relationship between prior knowledge and new learning of adult subjects. Previous studies have shown subjects' initial misunderstandings and personal goals can interfere with learning desired information (Marshall, 1985), and many adults hold onto their initial misunderstandings even after reading well-written text explicitly refuting the misconception (Marshall, 1986). When this happens, most subjects are not even aware of inconsistencies between their understanding and information in the text (Marshall, 1987). Similar results were found with different content (Alvermann & Hynd, 1986, 1987; Hynd & Alvermann, 1986).

All of these studies were conducted using science concepts because many people develop their concepts of scientific reality from naive observations of the world, and this can lead to the development of misconceptions. Most scientific misconceptions tend to be based on intuitive understanding related to direct experiences with situations that do not generalize to the scientific concept under consideration. For instance, many adults believe that seasons vary as the distance between the Earth and the Sun varies. After all, one is warmer when one is closer to a source of heat, so it is logical to postulate similar causality when heavenly bodies are involved. Thus direct experience contradicts the scientific reality.

The current study investigated effects of different ways of presenting scientific information on overcoming subjects' misconceptions about causes of seasonal change. Since the topic is found in science curricula, it was decided that one way of presenting information would be a demonstration presented as a discovery learning experience. Many science educators believe this method of instruction produces better learning of science concepts, although Anderson and Smith (1984) found that fifth graders receiving discovery learning lessons still held misconceptions with which they began the lessons. Another method of information presentation was use of a written text explicitly refuting the misconception about seasonal change and explicitly stating its actual causes. The value of such texts in overcoming misconceptions is in doubt. Maria (1987) found text that explicitly addressed a misconception improved learning of the appropriate concept whereas Alvermann and Hynd (1986) found the opposite. Combinations of these instructional treatments were also studied. This resulted in a total of five treatment conditions:

1. Reading the passage only (TEXT ONLY);
2. Reading the passage twice (TEXT/TEXT);

3. Participating in the demonstration only (DEMO ONLY);
4. Participating in the demonstration and then reading the passage (DEMO/TEXT); and
5. Reading the passage and then participating in the demonstration (TEXT/DEMO).

It was hypothesized that when subjects encountered information twice there would be greater opportunity for concept change, and that reading twice would be less likely to produce concept changes than would the DEMO/TEXT and TEXT/DEMO conditions because the latter two contain information presented in two different ways, enabling subjects to use both direct experience and text as sources of new learning. Further, it was hypothesized that the DEMO/TEXT condition would produce the greatest gains because the demonstration could provide learners with a frame of reference for learning details in the text. Likewise, the DEMO ONLY condition was expected to produce greater concept change than the TEXT ONLY condition because direct experience is more likely to produce new ways of thinking. These hypotheses can be expressed in the following equation:

DEMO/TEXT > TEXT/DEMO > TEXT/TEXT > DEMO ONLY > TEXT ONLY.

METHOD

Subjects

Subjects were 45 college juniors and seniors selected from a larger pool based on their responses to a 10-item multiple-choice pretest about the causes of seasonal change. They had all selected at least five misconceptions and no more than four correct answers, a pattern indicative of adults who hold the common misconception that distance between the Earth and the Sun causes seasonal change.

Subjects were assigned to treatment groups using stratified random sampling based on their pretest results. Each treatment group contained subjects who answered only one or two questions correctly and a few who had answered three or four questions correctly. One-way analysis of variance was performed to confirm that subjects in each treatment group were similar in pretest performance. There were no differences in pretest performance for any of the treatment groups, $F(4, 40) = .0592$, $p > .05$.

Subjects were in an undergraduate elementary education program and had taken two college-level science courses, one of which was general environmental science. All had also taken or were currently taking a course in teaching elementary science. Four were males and 41 females, ranging in age from 20 to over 40, although most were in their 20s. Thirty were native speakers of English and 15 of Spanish, but all were proficient in English.

Materials

The written text was an excerpt taken from a freshman astronomy textbook (Baker, 1959) selected for the clarity with which causes of seasonal change were discussed. Slight modifications were made to guarantee that the same information could be presented in demonstrations. Final version of the text was 1,245 words and contained four figures reinforcing information given in the text. It directly refuted the common misconception and was explicit about the complex relationship between the tilt of the Earth on its axis and the variation in the directness of sunlight that actually causes seasonal change.

A demonstration was then created using a globe, a lightbulb, and a drawn path indicating the shape of the Earth's orbit around the Sun. Information presented in the demonstration was identical to that in the text. Problems with the misconception and the actual causes of seasonal change were covered thoroughly. The demonstration was presented with teacher verbalization used only to direct attention and to point out facts not clear in the demonstration but essential to understanding.

Procedure

Each treatment group (TEXT ONLY, TEXT/TEXT, DEMO ONLY, DEMO/TEXT, TEXT/DEMO) met separately with the investigator for three sessions. The first was used to teach subjects how to show causality in a diagram by using causal chaining. This is a representation of the way one cause can lead to another and of how several causes can lead to a single outcome. The procedure was demonstrated by the investigator, and subjects had three chances to practice it with guidance from the investigator.

In the second session, subjects received the treatment. Each was given a booklet. Depending on the treatment, the booklet contained either 11 pages (TEXT ONLY and DEMO ONLY) or 21 pages (TEXT/TEXT, DEMO/TEXT, and TEXT/DEMO). On the first page, subjects were directed to make a diagram of their existing understanding of the causes of seasonal change and to rate their confidence in the accuracy and completeness of the diagram using a 5-point scale with 5 representing complete confidence and 1 representing complete lack of confidence. Then they encountered the new information presented in nine sections with specific content introduced in each section except for the ninth, which was a summary. After each section, subjects were asked to list new and contradictory information they had encountered and to rerate their confidence in the completeness and accuracy of their original diagrams. They were also encouraged to write comments about their thinking. Subjects receiving the information twice then repeated the procedure a second time. After the subjects had completed the treatment, each created a new diagram representing their current understanding of the causes of seasonal change and rated their confidence in the completeness and accuracy of the new diagram.

The third session occurred 2 weeks after the treatment sessions. At this time, subjects wrote a lesson plan to teach fourth graders about the causes of seasonal change and then retook the pretest.

RESULTS

Statistical Analyses

Gain between pretest and posttest performance was analyzed using a t test for repeated measures. This showed a significant gain in answering questions correctly for all subjects, $t(44) = 11.82$, $p < .001$.

Gain in correct answers due to differences in treatment was computed using one-way analysis of variance. This showed there was significant increase in choice of correct answers on the posttest that could be attributed to the treatments, $F(4, 40)=4.58$, $p<.01$. Mean gains (and standard deviations) for correct answers to misconceptions from pretest to posttest were as follows: TEXT ONLY = 2.4 points out of 10 (2.1); TEXT/TEXT = 6.7 (3.4); DEMO ONLY = 5.2 (3.3); DEMO/TEXT = 8.1 (.50); TEXT/DEMO = 5.6 (4.1).

Amount of information in the diagram produced before and after treatment was compared; gain was analyzed using a *t* test for repeated measures. There was a gain of 2.6 ideas which proved to be statistically significant, $t(44)=4.9$, $p<.001$. Mean gain (and standard deviations) by group was as follows: TEXT ONLY = 2.2 (2.2); TEXT/TEXT = 4.4 (6.0); DEMO ONLY = 2.3 (1.0); DEMO/TEXT = 2.8 (4.0); TEXT/DEMO = 1.3 (2.1). These gains due to treatment were analyzed using one-way ANOVA. No significant differences due to treatment were found $F(4, 40)=1.09$

Amount of *correct* information in the diagram before and after treatment was also compared. Mean gain (and standard deviations) were as follows: TEXT ONLY = 3.4 (2.7); TEXT/TEXT = 5.6 (5.9); DEMO ONLY = 2.9 (1.8); DEMO/TEXT = 3.7 (4.2); TEXT/DEMO = 1.9 (2.9). No significant difference due to treatment was found when amount of correct information in the diagrams was analyzed, $F(4, 40)=1.2$, although there was a mean gain of 3.5 pieces of correct information across all treatments, $t(44)=6.12$, $p<.001$. These data showed that there were significant gains in the amount of information added to the diagrams after the treatments but that none of the treatments differentially affected these gains.

However, when presence or absence of the common misconception in diagrams was analyzed using a chi-square procedure (Table 1), there were significant differences due to treatment, $\chi^2(1, N=45)=26.67$, $p<.001$. Subjects who received the DEMO/TEXT treatment showed the greatest reduction in the misconception, $\chi^2(1, N=45)=11.45$, $p<.001$, whereas those who received the TEXT/DEMO treatment showed no significant reduction, $\chi^2(1, N=45)=2.49$.

A similar pattern was found when the diagrams were analyzed for the presence of information that tilt of the Earth on its axis causes seasonal change (simple cause). The differences due to treatment were again significant, $\chi^2(1, N=45)=27.83$, $p<.001$. However, different patterns due to treatments emerged. Subjects who received the TEXT ONLY treatment showed the greatest gain in amount of correct information in the final diagram, $\chi^2(1, N=45)=14.40$, $p<.001$; subjects who received the DEMO ONLY treatment showed the least gain, $\chi^2(1, N=45)=2.10$.

Finally, the inclusion of the more complex set of causal relationships (that tilt of the Earth affects the directness of sunlight, and this causes seasonal change) was also analyzed. None of the subjects made any reference to this explanation in their initial diagrams, and only eight included it in their final diagrams. This gain was statistically significant over all treatments, $\chi^2(1, N=45)=7.59$, $p<.01$. The only treatment group showing an increase in the mention of the complex cause was the DEMO/TEXT group, $\chi^2(1, N=45)=5.14$, $p<.025$.

Changes in confidence ratings reported before and after treatment and after each section of the treatment were also analyzed. Subjects who showed greatest gain in

Table 1

Differences in Content of Initial and Final Diagrams Due to Treatment

	Misconception		Tilt as Cause		Tilt & Directness as Cause	
Treatments	Y	N	Y	N	Y	N
TEXT ONLY						
before	7	2	0	9	0	9
after	3	6	8	1	1	8
χ^2	3.6		14.4****		1.1	
TEXT/TEXT						
before	7	2	2	7	0	9
after	1	8	7	2	3	6
χ^2	8.1***		5.6**		3.6	
DEMO ONLY						
before	5	4	4	5	0	9
after	1	8	7	2	0	9
χ^2	4.0*		2.1		0.0	
DEMO/TEXT						
before	7	2	3	6	0	9
after	0	9	7	2	4	5
χ^2	11.5****		3.6		5.1**	
TEXT/DEMO						
before	4	5	2	7	0	9
after	1	8	7	2	0	9
χ^2	2.5		5.6**		0.0	
Total						
before	30	15	11	34	0	45
after	6	39	36	9	8	37
χ^2	26.7****		27.8****		7.6***	

*$p<.05$. **$p<.025$. ***$p<.01$. ****$p<.001$.

confidence between initial and final diagrams were in the TEXT/TEXT group (gain of 13 points) and those who showed the least gain in confidence were in the DEMO ONLY group (1 point). Although statistical significance cannot be demonstrated because of the nominal nature of the data, differences in confidence ratings are sufficiently great to postulate a connection between confidence and the differences in treatment.

Unfortunately, similar clarity in results was not found when confidence ratings that appeared on each page of the booklet were analyzed. A few subjects within each group showed high confidence throughout, but most showed only slight confidence at all points.

Descriptive Analyses

Data were reviewed for patterns that could be observed in subjects' written statements, including information subjects listed as new or contradictory after each part of the treatment, the lesson plans written by the subjects, and self-evaluative statements subjects produced during treatment.

There were no clear patterns in subjects' statements about the new and contradictory information they noted. Only 5 subjects stated that information about distance not causing seasonal change contradicted their initial understanding. Four of these were among the subjects who had the complex causality included in their final map. All other subjects who listed the information that distance did not cause seasonal change listed it as new but not as contradictory information. Thus there seems to be little relationship between change in understanding and subject self-awareness.

The lesson plans written after the 2-week delay were also analyzed. Only 8 subjects produced plans containing sufficient information about lesson content and instructional procedures to evaluate their knowledge of topic. They came from all treatment groups, and there was no correlation between completeness of the plan and inclusion of the complex cause of seasonal change in the final diagram.

Finally, subjects' self-evaluative statements and comments addressed to the investigator were reviewed. Once again, no patterns due to treatment were discernable. Rather, self-evaluation seemed to be minimal and the result of subject differences.

DISCUSSION AND IMPLICATIONS

Some of the present data are conflicting, but this reflects the complexity of conceptual change. If one looks at results of the posttest and at differences between initial and final diagrams, the DEMO/TEXT treatment produced the greatest amount of new learning and the greatest change in understanding of causes of seasonal change. This is consistent with the original hypotheses and supports the belief that demonstrations act as schema activators, thus increasing chances of instantiation when students encounter the same information in written form.

To a lesser extent, the same conclusions can be drawn from the TEXT/TEXT condition. This treatment produced similar results although gains were less and subjects did not develop an understanding of the complex cause of seasonal change. It seems that the first encounter with the text acted much as the demonstration did but that the text led to structuring a schema that produced less new learning.

The TEXT/DEMO treatment proved to be no more effective than the DEMO ONLY treatment, which shows that multiple presentation of information was not the primary factor in producing new learning. Rather, multiple presentation had to have text as the second mode before any changes in understanding occurred. Furthermore, subjects were more confident about their understanding when reading text and most confident in the TEXT/TEXT condition. It seems that subjects were able to abstract relevant factual information from text and to use the initial demonstration as the most effective frame of reference for new learning.

Lack of learning produced by the TEXT/DEMO treatment has instructional implications. The most prevalent use of factual text, assigning a topic and having students read it before class, is inefficient. This study shows that greater learning occurs when text is encountered after the topic is presented. Additional research is needed to confirm this finding.

The TEXT ONLY treatment produced the least new learning. This result supports the initial hypotheses. Subjects in this treatment group showed no reduction in misconception. Rather, they seemed to add the concept about the tilt of the Earth on its axis to their existing understanding thus ending up with the understanding that the Earth is closer to the Sun in the summer and is tilted in that direction. This finding is consistent with previous research (Anderson & Smith, 1984) that reading text does not produce concept change and supports Alvermann and Hynd's (1986) findings that college students do not change their understanding, even when written text is explicit about inaccuracy of the misconception.

It seems that students can make small changes in understanding, but if one looks for evidence of true conceptual change, there is little to be found. Although diagrams produced after treatments contained more information, new concepts were tacked onto the previous diagram with little thought for consistency or logic. The final diagrams were less coherent than the initial ones. Based on subjects' insights, there was little awareness of lack of consistency in the final diagrams.

These results are not surprising since the only procedures found to produce true conceptual change are those involving teacher-student questioning and mutual, in-depth exploration (Roth, Smith, & Anderson, 1984). Controls built into the study prevented this verbal interaction and could be a major cause of lack of true conceptual change. Subsequent research using the same treatments with the addition of teacher-student interaction should be pursued.

Another finding was lack of subject self-awareness during and after encountering information that contradicted initial understanding. This seems to contradict the research on self-monitoring by good readers (e.g., Baker & Brown, 1984). However, one recent study (Presley & Ghatala, 1988) supports these results. They found that adult subjects were frequently unaware of their failure to comprehend when taking a multiple-choice comprehension test. Perhaps there is a minimum level of knowledge about a topic that is needed before students can be efficient at self-monitoring and other metacognitive tasks. This is a rich area for future research.

This study has shown that neither written text nor teacher-directed demonstration can overcome subjects' misconceptions. Misconceptions are maintained because they seem logical to subjects based on previous experiences. As Strike and Posner (1985) point out, conceptual change can occur only when four conditions are met: (a) dissatisfaction with existing understanding, (b) minimal understanding of new concept, (c) plausibility of new concept, and (d) potential for new areas of inquiry. Data from this study show that only the second condition was met.

It is not surprising that neither written text nor teacher-directed demonstration alone can produce cognitive dissonance since neither exists for this purpose. Both exist to present relevant information. It is time we stop expecting materials to cause in-depth thinking in students and realize that text functions admirably as a source of information; teachers are the optimal source of thought-provoking activities.

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EFFECTS OF *IF-THEN* USAGE UPON URBAN STUDENTS' INFERENCE GENERATION DURING AMERICAN HISTORY READING

Grover C. Mathewson
Florida International University

Vosniadou and Brewer (1987) pointed out that few studies have explored possible mechanisms for restructuring background knowledge. Lack of information concerning knowledge restructuring is significant for reading instruction because new information obtained from text is not expected to accumulate as unrelated facts, but must be integrated with previous background knowledge if understanding is to occur. Identification of an effective strategy through which students can integrate background knowledge with information from text was the purpose of this investigation. The first question was which approach might best serve the purpose of restructuring.

Studies in Vosniadou and Brewer's review examining mechanisms of knowledge restructuring focused on schema induction, metaphor and analogy, similarity, explanation-based mechanisms, generalization and specialization, differentiation and coalescence, and Socratic dialogues (Vosniadou & Brewer, 1987). These may be used to achieve radical restructuring, a cognitive reorganization in which domain, structure, concepts, and terms describing a phenomenon change. An example of radical restructuring is a shift from believing the earth is the center of the universe to believing that the planets orbit the sun.

Mechanisms of knowledge restructuring also can accomplish relational restructuring. This restructuring occurs when abstract relational schemata interconnect knowledge representations in new ways. New interconnections do not change representations, but organize them into more complex patterns through addition of superordinate categories and other linkages. Relational restructuring was chosen as the focus of this study because it helps to differentiate novice from expert knowledge (Vosniadou & Brewer, 1987).

A way for readers to achieve relational restructuring is to apply domain-independent inferential rules to their knowledge representations (Hagert & Waern, 1986). Domain-independent inferential rules can be used along with other kinds of rules, such as pragmatic rules of language, to reach new conclusions (Sperber & Wilson, 1986). For example, Hagert and Waern (1986) pointed out how the rule known as material implication allows inferences to be relationally generated within a propositional network through the sentential form a → c. This sentential form means that one proposition (usually called the antecedent) implies a second proposition (usually called the consequent). The antecedent and its consequent must be meaningfully related for a restructured relationship to be true (Hoaglund, 1986). The relationship is false, however, if a true antecedent has been construed to imply a false consequent.

Using domain-independent inferential rules such as material implication to restructure propositional networks has not been explored in the reading literature. However, these rules appear applicable to reading if they are taught functionally rather than abstractly and if too many rules are not taught at once.

The present study is based on the concept that a functional application of material implication can help readers in content areas restructure propositional networks. The study's major prediction is that students can learn to extend their cognitive networks by selecting antecedent "seed propositions" (Rips & Marcus, 1977) from social studies reading materials and attaching new consequents to these seed propositions, creating relationally restructured propositional networks. These relationally restructured networks would be extended from their previous state by new antecedent/consequent connections.

For example, students using the network extension strategy during reading might select a statement from the text such as "When Lincoln was assassinated in April 1865, Congress was not in session." They would regard this seed statement as an antecedent for which possible consequents could be found. A possible consequent is "Some people would want Congress to be called into special session after the assassination." Whether true or false, the new consequent provides a tentative extension of the cognitive network. This extension could provide a basis for further inquiry which would either confirm or refute the extension.

It was hypothesized that students taught to identify antecedent seed statements from social studies textbooks and to search background knowledge for possible consequents would subsequently write more elaborated responses, use more covariance (if-then) sentence structure, and give more relevant responses than would either of two control groups. Confirmation of these hypotheses would suggest that locating antecedent statements in text and searching background knowledge for possible consequents is a way to achieve cognitive network extension in social studies reading.

METHOD

The study was done at an urban Miami, Florida, high school with 72 students distributed among five 11th-grade American history classes. Stanford Achievement Test (Gardner, Rudman, Karlsen, & Merwin, 1982) median reading percentiles in the five classes were 67, 72, 52, 48, and 41. The first two classes were "advanced placement" classes; the last three were for college-bound students.

Students within each class were randomly assigned to an experimental group and two control groups. The experimental group ($N=24$) was designated the Network Extension group. Network Extension group students were given 10-page study guides. The first 5 pages were instructional. These showed students how to identify seed statements called "antecedents" in paragraphs from their history books and how to search their imaginations for possible "consequents" based on the antecedents. The last 5 pages provided practice in locating textbook antecedents and generating original consequents.

The study guides did not attempt to teach metacognitive understanding of the Network Extension process beyond helping students identify promising textbook statements as antecedents and search their imaginations for consequents. The underlying idea of these study guides was to enable students to carry out the intended process, not to inform them of its theoretical foundation or technical aspects. Both verbal and graphic explanations and examples were used in the guides to help students identify antecedents and search for consequents.

The Network Extension group was given a different version of the guide on each of 3 days during the first week of the experiment (see Appendix A for a partial example of a study guide). The versions progressively developed students' ability to identify antecedents and search for consequents. Successively fewer supportive prompts were given from version to version. Experimental sessions, conducted by the experimenter or a research assistant, were 25 minutes long.

The first control group ($N = 23$) was the Cued Inference group. Their study guides had the same format as the Network Extension guides, but differed in that they did not show students how to generate new ideas. The Cued Inference guides taught students to read actively and to write down any new ideas that came to mind. The Cued Inference group was designed to control for the possibility that simply asking students to develop new ideas without showing them how was sufficient to extend cognitive networks based on history reading.

The second control group was the Summary group ($N = 25$). Their study guides also had the same format as the Network Extension guides. However, their guides were designed to teach summarizing skills, not to help develop any new ideas from reading.

Within each class on Monday, Wednesday, and Friday, students in all groups worked silently on their guides during the same 25-minute periods. They were not told of differences among guides, but were informed that the guides would help them learn American history.

A posttest was given at the end of the first week. Each of the five pages of this test presented a different paragraph from a chapter in students' history books; students had not read the chapter yet. Paragraphs were followed by blank lines with the boldface header "New Ideas." Directions instructed students to write down new ideas occurring to them after they read each paragraph. Students were also advised to apply strategies from the study guides they thought would be helpful to them. Directions were the same for all groups. Students were given 20 minutes for the posttest. One week following the posttest, a delayed posttest was given, using the same method and format, but the content of the paragraphs was different. Students were aware that they would be given the delayed posttest.

The experimenter and two assistants did blind coding of students' written responses on both tests. The first coded variable was summation of number of propositions in students' written responses. A proposition was defined as an independent or dependent clause containing a stated or elided subject and verb. Because only extensions of paragraph ideas were of interest, irrelevant propositions (e.g., student comments) and propositions restating information in test paragraphs were not coded.

The second coded variable was summation of instances of covariance sentence structure (Meyer, 1975). Sentences were coded if they included any of the following covariance signal words: *accordingly, because, consequently, if, since, so that, then,* *therefore, this led to,* and *thus. Then* was not coded as covariance if it only signalled time sequence.

Coders scored relevance on a 1 to 7 (low to high) scale indicating degree to which each of the students' propositions was meaningfully related to its antecedent and to general context of the test paragraph. Another factor in relevance scoring was number of possible contextual implications of a student-generated proposition. If implications of a proposition were many, scoring of that statement was high. Relevance did not depend on truth of propositions, but only on the semantic relationship of propositions to the test paragraph. The final relevance score was a proportion representing relevance per proposition. Because judgment of relevance was more subjective than counting numbers of propositions or covariance sentence types, coders were trained in assessing propositional relevance until they achieved acceptable interscorer reliability.

RESULTS

Number of propositions, covariance, and relevance were analyzed using a 3 × 5 × 2 MANOVA in which independent variables were group, class, and test. Multivariate planned comparisons contrasted (a) Network Extension group with a combined Cued Inference and Summary group, and (b) Cued Inference group with Summary group. If multivariate tests were statistically significant, univariate tests were performed. Mean scores are in Table 1.

A multivariate planned comparison confirmed the prediction that the experimental group would write more propositions, use more covariance sentence structure, and write with greater relevance than the combined control groups, $F(6, 86) = 4.26$, $p < .01$. Univariate analysis, however, revealed that only covariance, $F(1, 57) = 19.02$, $p < .0001$, and relevance, $F(1, 45) = 5.91$, $p < .05$, contributed to the significance of the multivariate F. Number of propositions was not greater for the Network Extension group than for the control groups, $F(1, 57) = .70$, $p > .40$.

A second multivariate planned comparison showed that the Cued Inference group outperformed the Summary group, $F(9, 104) = 19.30$, $p < .0001$. Univariate analysis showed that number of propositions, $F(1, 57) = 11.98$, $p < .001$, and number of covariance sentence structures, $F(1, 57) = 5.27$, $p < .05$, contributed to the difference, but relevance did not, $F(1, 45) = 1.66$, $p > .20$.

That the Cued Inference group outperformed the Summary group suggested a further analysis to determine whether the Network Extension group differed from the Cued Inference group alone. Results of a Neuman-Keuls test showed the Network Extension group exceeded the Cued Inference group in covariance sentence structure and in relevance, $p < .05$, but not in number of propositions generated, consistent with MANOVA results.

Strength of effects declined over all measures for all groups from the first to the second week, $F(3, 43) = 9.73$, $p < .0001$. An interaction effect of group by week, however, indicated the Summary group wrote more propositions during the second week than the first, $F(2, 57) = 6.96$, $p < .002$.

Finally, there was a multivariate effect of class, $F(12, 114) = 4.74$, $p < .0001$, indicating that some classes performed better than others. However, class did not

Table 1

Means and Standard Deviations for Network Extension, Cued Inference, and Summary Groups

	Posttest			Delayed Posttest		
Group	Propositions	Covariance	Relevance	Propositions	Covariance	Relevance
Network Extension						
M	14.17	2.41	5.59	9.02	1.45	4.82
SD	5.05	1.77	1.45	4.25	1.71	1.19
N	24.00	24.00	24.00	24.00	24.00	23.00
Cued Inference						
M	14.18	1.23	4.67	11.85	1.08	4.34
SD	9.29	1.06	1.35	6.71	.98	1.49
N	23.00	23.00	22.00	23.00	23.00	22.00
Summary						
M	7.45	.27	4.68	8.77	.70	3.50
SD	8.32	.87	1.83	6.96	.86	1.10
N	25.00	25.00	16.00	25.00	25.00	20.00

interact significantly with group or with test. Lack of interaction provided evidence that group and test variable effects were independent of student ability. Lack of interaction also provided a rationale for collapsing the class variable in Table 1.

DISCUSSION

Results supported the hypotheses with an important qualification. Although the Network Extension study guides led to more frequent use of covariance sentence structure and to greater relevance of propositions, it did not result in greater numbers of propositions. It appears that instruction in use of the Network Extension strategy improves quality of responses, but not necessarily quantity.

The Cued Inference group had been encouraged to find new ideas, but had not been given any strategy for doing so. Nonetheless, they generated more instances of covariance and more propositions than the Summary group. This suggests that mere encouragement to extend ideas can lead to an increase. Propositions of the Cued Inference group, however, were no more relevant than those of the Summary group and were less relevant than those of the Network Extension group. Instruction in Network Extension or a similar strategy may be necessary to improve relevance of student conclusions.

In spite of success of instruction in Network Extension, students in this group scored lower in the delayed posttest than in the posttest. This implies that continued instruction in Network Extension is needed if benefits of extending idea networks based on expository reading are to endure. It did appear that three sessions of study guide instruction were sufficient for 11th-grade students in the Network Extension group to grasp and subsequently use the technique for a limited time.

Number of propositions generated by the Summary group increased from posttest to delayed posttest. A possible explanation is that training in summarizing suppresses generation of new consequents in subsequent reading. This speculation requires further investigation.

Success of the Network Extension strategy has implications for development of comprehension strategies in reading. From the perspective of a propositional cognitive network with logical interconnections among propositions, adding new propositions to the network as a result of reading is minimally useful unless new propositions are integrated with preexisting propositions. This study provides evidence that this integration may be done through the Network Extension strategy. This strategy rests primarily on the concept of material implication (Copi, 1986), a domain-independent inferential schema formally defining ways antecedents are related to consequents.

Although the study has emphasized a search of background knowledge for possible consequents, there is an alternative perspective. Linden and Wittrock (1981) and Wittrock, Marks, and Doctorow (1975) have suggested that students actively generate new cognitive representations for words and sentences during reading. Applied to the present study, this point of view suggests students actively created new consequents rather than merely found them. This conclusion implies that Network Extension may promote radical as well as relational restructuring because domains of thought, cognitive structures, and concepts all may be changed as new propositions are created and combined in search for new antecedent-consequent connections.

Finally, it is interesting to consider roles propositions played. Use of propositions as units of knowledge representation in cognitive networks has been supported by investigators in areas ranging from philosophy (Salmon, 1986) to cognitive science (Pylyshyn, 1984) and the psychology of language (Wilson & Sperber, 1986). The theoretical construct of proposition was used in the present study because it provided a foundation for the Network Extension strategy and a basis for data coding. It should also be pointed out that Pylyshyn (1984) cautioned that the mind probably deals in unutterable "sentence analogues" at some deep sense, and that these sentence analogues probably operate according to their own rules. However, the concept of propositions within cognitive networks proved easy to apply in this study, both at a theoretical and an operational level. It appears that, in addition to supporting the hypotheses, the present study supports the application of propositional cognitive networks and domain-independent rules of inference to reading in content areas.

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APPENDIX A

Page 1

Study Guide #1

New ideas can come from reading. Some of these new ideas are not in the actual pages that you read, but instead come from your thinking after you read.

Suppose, for example, that you read the material in the box below.

The United States' Interest in Florida

> The United States had long wanted all of Florida. Then in 1818, the federal government ordered General Jackson to protect southern and western settlers against Indian attacks from eastern Florida. He was told that he could follow Indian raiding parties back into Spanish Florida. Jackson—who was no Indian lover—responded to this assignment with enthusiasm. Supposedly chasing Indians, he swept across East Florida, capturing the Spanish strongholds of Pensacola and St. Marks on the way.

The information in the box is interesting, but you can make more of it. For example, you can locate a statement in the reading selection that seems important to you. Then you can draw a new conclusion from the statement.

Suppose you think that the statement "He was told that he could follow Indian raiding parties back into Spanish Florida" is interesting and has consequences. First, you could circle the example statement in the paragraph, as is done below.

> settlers against Indian attacks from eastern Florida. He was told that he could follow Indian raiding parties back into Spanish Florida. Jackson—who was no

Then you could write this statement on a separate sheet of paper under the heading "ANTECEDENT," as below.

ANTECEDENT ← The ANTECEDENT is a statement that will lead to another statement.

He was told that he could follow Indian raiding parties back into Spanish Florida.

Turn to next page →

Page 2

Now you have a statement from the paragraph that you think might lead to a new idea. This statement (the ANTECEDENT) was just chosen as an example. You might have chosen a different one from the paragraph.

What do you do once you have a statement from the paragraph? You search your imagination for another idea that comes from this statement. To do this, it helps to place the word "IF" in front of the ANTECEDENT statement and the word "THEN" in front of the statement that you are going to create using your imagination.

	ANTECEDENT		**CONSEQUENT**
IF	He was told that he could follow Indian raiding parties back into Spanish Florida.	**THEN**	
	↑ Statement from Paragraph		↑ Statement from Your Imagination

As you can see, the "Antecedent" from the paragraph and the "Consequent" from your imagination are preceded by the words IF and THEN.

Now, how do you find the consequent? The answer is that you brainstorm your imagination to see what statements could possibly come from the antecedent. Below is a possible list:

THEN he was very happy.
THEN he used it as an excuse to attack the Spaniards.
THEN he said that he needed more troops and weapons.
THEN the Indians heard rumors about what Jackson was told.

All of the above are possible CONSEQUENTS of the statement "He was told that he could follow Indian raiding parties back into Spanish Florida." Now, which one of them is the best?

Suppose you thought that the third statement was the best. It would then become your CONSEQUENT. You would then put it in the "CONSEQUENT" box, as has been done below.

	ANTECEDENT		**CONSEQUENT**
IF	He was told that he could follow Indian raiding parties back into Spanish Florida.	**THEN**	He said that he needed more troops and weapons.

Your choice for a consequent.

Turn to next page →

EFFECTS OF INSTRUCTION AND TEXT AVAILABILITY ON QUALITY OF SCIENCE TEXT SUMMARIZATION

Martha H. Head
Southeastern Louisiana University

John E. Readence, Leslie S. Arceneaux, and Elizabeth L. Willis
Louisiana State University

Ever since Kintsch and van Dijk (1978) stated that readers form a gist of a passage when they comprehend it, summaries, both written and oral, have been used as a means of measuring comprehension. In recent years, the practice has become quite common.

Despite this research trend, young readers have been shown to be fairly poor at summarizing (e.g., Garner, Belcher, Winfield, & Smith, 1985; Johnson, 1983; K. Taylor, 1986; Winograd, 1984). Several researchers have recommended direct instruction in summarizing (e.g., Brown & Day, 1983; Garner et al., 1985; Winograd, 1984), and several instructional studies have met with reasonable success (e.g., Bean & Steenwyk, 1984; Rinehart, Stahl, & Erickson, 1986; B. Taylor & Beach, 1984).

Head, Readence, and Buss (1987) examined predictive effects of instruction on summary writing of middle-school students in the social studies area and found that instruction was a significant predictor of the relative importance of ideas and number of intrusions, or deviations from text information, included in a subject's summary. However, this investigation did not examine subjects' ability to use rules taught through direct instruction. It would seem that subjects who are able to effectively use summarization rules are, by definition, including important ideas while deleting trivial ones. Therefore, in an effort to extend previous findings on instructional effects to the area of summarization rule use, a 3-day instructional treatment was included in the present study. Further, extension of the effects of instruction was sought in a novel content area, science.

Another variable shown to affect summary performance is text availability during summarization (Hidi & Anderson, 1986). In the studies cited above, subjects were asked to summarize with the text available for lookbacks or from memory. In the Head et al. study (1987), both text-absent and text-present conditions were used to examine predictive effect of text availability on summarization abilities of sixth graders in social studies. Not surprisingly, it was found that text availability was a significant predictor of text-dependent idea units found in a summary. Also, text availability predicted important ideas taken from the target passage and the number of intrusions included in a summary. However, the question again arises, is it only vital to include important

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idea units, even if those idea units are "lifted" directly from text, or, as we believe, is a good summary one that involves synthesis of important ideas? Therefore, the present study includes both text-absent and text-present conditions to study their effects on summarization rule use.

METHOD

Subjects

Subjects were 91 sixth-grade students in two middle schools in a large southern city. Students were below-average to above-average in reading ability, as evidenced by standardized comprehension test scores from the Stanford Achievement Test (Form A) (Kelley, Madden, Gardner, & Rudman, 1982) and teacher judgment. Grade equivalents ranged from 2.1 to 12.3 ($M = 6.78$, $SD = 2.99$). Subjects were in four language art classes, and reading scores were used for stratified random assignment to either instruction or no-instruction groups.

Materials

Target passage. Because prior research has shown topic interest to have statistically significant effects on summarization (Head & Buss, 1987; Head et al., 1987), a passage on a topic consistent with subjects' expressed interest was chosen for summarizing. To select an appropriate passage, a topic interest inventory was administered. The instrument consisted of 20 topics in science chosen randomly from 3 sixth-grade science textbooks. The directions asked subjects to rate, on a scale of 1 (lowest) to 7 (highest), how much they would like to read about the topics in their science classes. Scores ranged from 1 to 7. The topic "rattlesnakes" was one for which subjects expressed relatively high interest ($M = 4.64$, $SD = 2.38$). The passage chosen was "The Rattlesnake and Its Enemies." This passage has been used in a previous study (Alvermann, Smith, & Readence, 1985) and had a sixth-grade readability level (Fry, 1977).

Prior knowledge test. Because prior knowledge has also been shown to have a predictive effect on summarizing (Head & Buss, 1987), subjects' prior knowledge of the passage was measured. The prior knowledge test consisted of 28 multiple-choice questions. All questions dealt with general topics in science, but 10 questions tapped important information from the target passage. Only these 10 questions were scored. Results showed most subjects possessed a rather modest amount of prior knowledge of the passage topic, with scores ranging from 0 to 7 ($M = 3.17$, $SD = 1.48$). There was no difference between the instruction and no-instruction groups.

Writing ability. Subjects were asked to write a one-page composition on the topic "My View of (school name) Middle School." All essays were scored jointly by two researchers using an adaptation of the method described by Diederich (1974). The scale assessed both quality and organization of ideas with a weight of 5 points each. Scores could range from 0 to 10. Initial disagreements were resolved through discussion. Although actual scores ranged from 0 to 10, subjects were found to have average writing ability ($M = 5.53$, $SD = 1.74$). No difference between the instruction group and no-instruction group was found.

Instructional passages. Based on Head et al. (1987), materials for instruction were chosen to correspond to subjects' expressed interest, in this case, space travel. This passage described the Voyager satellite's first picture-taking mission to Jupiter. Its readability level was sixth grade (Fry, 1977).

Procedure

Pretesting. Topic interest and prior knowledge instruments were administered during regular class periods. Subjects completed the interest inventory first, followed by the prior knowledge test. The essay to assess writing ability was administered on the following day.

Instruction. Instruction began 2 days subsequently. Instruction was provided by three researchers and counterbalanced between the two groups, that is, both the instruction and no-instruction groups interacted with three different researchers to reduce instructor bias.

Treatment consisted of three class periods of direct instruction in summarization given on 3 consecutive days. Instruction proceeded in a modeling-guided practice-independent application design, with a gradual release of responsibility to the subjects (Pearson & Gallagher, 1983). Further, a rule-governed summarization approach patterned after Day (1980) was employed. Steps in the summarization process were taught as follows: (a) Read the whole paragraph and think about what it says; (b) write a sentence that tells what the paragraph is about; (c) leave out any details that are trivial; (d) leave out any ideas that are redundant; (e) group together any lists of similar ideas or actions; (f) evaluate what you have written to see if you've really given the main ideas of the paragraph; and (g) rewrite if necessary. An overhead projector displayed short passages to be summarized and to illustrate steps in writing a summary. In addition, a large poster was used as a reminder of the summarization steps. Instruction began with one-paragraph target passages; more paragraphs were gradually added until entire subsections were summarized at once.

The control group received training in vocabulary strategies for the same period of time, using a game format and teaching subjects to use graphic clues and morphemic analysis to unlock meaning of words.

Posttesting. After a 24-hour delay, posttesting commenced. Half of the subjects in the instruction and no-instruction groups were randomly assigned for this session to a text-present or a text-absent condition. Subjects read the target passage and wrote a summary of it, with text availability assigned by condition.

Scoring. Summaries were scored using a scale adapted from Winograd (1984). Sentences generated by subjects were classified as one of the following: (a) an intrusion, (b) a reproduction, (c) a combination, or (d) an invention. *Intrusions* were any sentence contrary to passage information. A *reproduction* was a sentence obtained by verbatim copying or memory of text. A *combination* was characterized by an effort to combine two or more sentences from the text. This combination might involve only a verbatim copying/memory of text or the joining of two or more sentences from the text in the subject's own words. An *invention*, considered the highest level of operation, was a sentence that could not be connected with any specific portion of the passage, but one in which the gist of the passage was still communicated. All summaries were scored jointly by two researchers; discrepancies were resolved through discussion.

RESULTS

Due to absences during the treatment period, data were analyzed for only 81 subjects. The four summary scores were converted to proportions by dividing the number of instances of each type of score by the total number of sentences in the summary. A multivariate analysis of variance was performed to determine effects of text availability and instruction. Because no significant interaction between the two design factors was observed, interpretation of main effects of text condition and instruction was possible. Table 1 presents means for the four scores.

As expected, text condition had a significant effect on summary scores, Wilks' Criterion $F(4, 74)=43.73$, $p<.0001$, Univariately, this effect could be seen in the proportion of intrusions ($F=15.79$, $p<.0001$) and reproductions ($F=10.92$, $p<.002$). Text-present subjects had proportionally fewer intrusions and proportionally more reproductions than did text-absent subjects. The instruction effect was also significant, Wilks' Criterion $F(4, 74)=247{,}80$, $p<.0001$. This effect was seen in the proportion of reproductions ($F=9.48$, $p<.0001$). Consistently, the control group had a higher proportion of reproductions than did the treatment group. Additionally, the instruction effect could be seen in the proportion of inventions ($F=15.79$, $p<.0001$) per summary. The treatment group consistently produced a significantly higher proportion of inventions than did the control group. No significant effects were observed for either text condition or instruction for combinations.

DISCUSSION

Several limitations of this study should be noted. First, only sixth-grade subjects participated so no conclusions can be offered across grade levels. Second, only one

Table 1

Proportions of Intrusions, Reproductions, Combinations and Inventions for Instructional and Text Conditions

	Intrusions	Reproductions	Combinations	Inventions
Trained	.090	.266	.347	.297**
Untrained	.153	.574**	.244	.029
Text-Present	.065	.510*	.234	.191
Text-Absent	.177*	.307	.367	.149

*$p<.002$. **$p<.0001$.

passage was used, and it represented only the science content area. However, it is encouraging that findings here corroborate earlier findings using another passage in the social studies content area. Finally, effects of treatment over time were not examined.

Examining the problem multivariately, both text condition and summarization instruction significantly affected subjects' summarization performance. Text-present subjects consistently produced a greater proportion of reproductions than text-absent subjects. Consequently, because the text was available, significantly fewer intrusions were produced. This finding should be of concern particularly for researchers. Both text-present and text-absent conditions have been used for summarization studies (e.g., Freebody & Anderson, 1983; Johnson, 1983; Smith, 1985). It seems important to consider purposes for which the summarizing task has been chosen. If summaries are to be used to measure comprehension, the question must be answered: Can comprehension truly be measured if subjects are simply copying the text at hand? Perhaps not. However, the problem of teasing out memory factors in asking subjects to summarize without text is also problematic.

With respect to instruction in summarization, it appears that we *can* teach sixth graders to more closely approximate "gist," whether or not the text is available. Untrained subjects were unable to write inventions with or without text. However, trained subjects were better able to write inventions regardless of text availability. Further, trained subjects wrote shorter summaries than untrained subjects (6.4 sentences on the average for untrained and 3.9 for trained). This implies that trained subjects attempted to be more succinct in their writing, which was a main focus of the instructional component. Further, they wrote a smaller proportion of reproductions in their summaries, that is, they learned from the instructional treatment that copying a text is inappropriate for writing a summary, and their behavior on the posttest matched what they had been taught.

Although the summarizing ability of trained subjects was enhanced, it is obvious that these subjects were still far from being expert summarizers after such a short instructional period. It is imperative that we realize the developmental aspects of ability to summarize efficiently and take this into account when considering any summarization technique as a measure of comprehension.

Further, it is becoming increasingly obvious that to use these measures at all, subjects must first be trained in the "how-to's" of summarization. This skill is not being taught in the middle school grades. Several control group subjects, in fact, asked for the definition of the word "summary" during the posttesting period.

Given the developmental quality of summarization, coupled with the lack of instruction in schools and the usual "one-shot" instruction we are frequently forced to use in research endeavors, careful consideration needs to be given to the way summaries are used.

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PRIOR KNOWLEDGE AND LEARNING FROM SCIENCE TEXT: AN INSTRUCTIONAL STUDY

Janice A. Dole
University of Utah

Edward L. Smith
Michigan State University

Researchers in reading and science education have provided compelling evidence that students come to classrooms with extensive prior knowledge about scientific phenomena, but often that knowledge consists of naive conceptions or misconceptions (Alvermann, Smith, & Readence, 1985; Clement, 1982; Driver & Erickson, 1983; Lipson, 1982; Maria & MacGinitie, 1981). Further, researchers have found that students are resistant to changing their prior knowledge, holding onto their existing knowledge despite conflicting information in science texts and even despite instruction (Champagne, Klopfer, & Anderson, 1980; Eaton, Anderson, & Smith, 1984; Lipson, 1982; Maria, 1987). What is clear is that students use their prior knowledge as a filter for interpreting new information, and that they have difficulty restructuring existing knowledge to accommodate new information that conflicts with that knowledge.

A few studies have been successful at changing students' naive conceptions about scientific concepts (Alvermann & Hynd, 1987; Champagne, Gunstone & Klopfer, 1985; Eaton, Anderson & Smith, 1984; Maria, 1988; Nussbaum, 1985). Roth (1985), for example, rewrote conventional text taken from a science textbook to conform to criteria for "considerateness" (Anderson & Armbruster, 1984), and to explicitly state and refute students' most common naive conceptions about photosynthesis. She found that students who read a conventional text about photosynthesis did not process information in ways that would allow them to change their naive conceptions. Students who read her augmented text, however, were able to process the new information to allow for conceptual change learning. Maria (1988) conducted a similar study, and was also able to bring about conceptual change learning through augmented text that was considerate and which directly identified and refuted students' prior knowledge. A major difficulty in both of these studies, however, was that texts had to be extensively rewritten to bring about conceptual change learning. Are there ways of accomplishing this other than through rewriting science texts?

Basic research in reading suggests that comprehension improves when prior knowledge is activated. In a series of studies (Bransford & Johnson, 1972; 1973; Dooling & Lachman, 1973) researchers demonstrated that readers who were given appropriate knowledge frameworks understood otherwise incomprehensible and poorly recalled passages. Research in science education has documented that students can change their thinking about scientific concepts when they are directly confronted with their prior knowledge and shown how this knowledge differs from scientifically accurate conceptions. Nussbaum and Novick (1982) successfully changed students' conceptions about the structure of gas by helping students activate their prior knowledge and then introducing new information that conflicted with this knowledge. Students were encouraged to make sense of the new information by changing their scientific conceptions about the structure of gas.

The present study examined effects of a teacher-directed monitoring strategy designed to activate students' prior knowledge and helped students monitor and integrate new information encountered in conventional text with their prior knowledge.

METHOD

Subjects

Subjects were 103 fifth graders from four intact classrooms in a suburban school district near a major Midwestern city. The district served a predominantly middle-class population.

Instructional Procedures

Two classes at one school comprised the treatment group and two other classes at the same school comprised the control group. Classes were self-contained and taught by four teachers. Two teachers volunteered to be the experimental teachers; the remaining two agreed to be the control teachers. All four teachers were considered by the principal to be "solid" and "good" teachers. All were very interested in the study and in ways they could improve their textbook instruction.

Experimental treatment. Experimental teachers, along with control teachers, taught the Matter Unit from their district-adopted science textbook (Mallinson, Smallwood, & Valentino, 1984). In combination with their regular text-based science instruction, the two experimental teachers used the Prior Knowledge Monitoring and Integrating (PKMI) strategy. The strategy is based on a set of Central Questions and thinksheets designed to guide pre-, during, and post-reading activities. The Central Questions framed the instructional unit and were the focus of discussion throughout the reading of the text instead of focusing on the questions the textbook provided. The three Central Questions used in this study are contrasted to the ones used in the student text:

Central Questions	*Textbook Questions*
1. What are objects made of?	1. What is matter made of?
2. What happens when water freezes/evaporates?	2. What happens when atoms combine?
3. What happens when a nail rusts?	3. What is an easy way to write the elements?

The problem with the textbook questions and ones typically used in many content area textbooks was that scientific or textbook knowledge is required to understand and answer them. In contrast, the three Central Questions could be answered based on students' prior knowledge. The use of the Central Questions ensured that students activated their existing knowledge about the topics related to the Matter Unit.

Thinksheets were developed on which each Central Question was written and were divided into several columns. In the first column students recorded everyday ideas; in the next column they recorded scientific ideas from their textbooks. In the next four columns students checked if: (a) the text ideas were the same as their everyday ideas, (b) the text ideas added information to their everyday ideas, (c) the text conflicted with everyday ideas, or (d) the text was confusing.

A week before teachers began the Matter Unit, a series of introductory lessons were presented to the experimental students to teach them the PKMI strategy. These helped students recognize when texts presented ideas that were the same as students' everyday ideas, when texts added scientific ideas based on what students already knew, when texts presented ideas that conflicted with everyday ideas, and when texts were confusing. Students practiced using the think sheets in small groups with nonexperimental texts.

The two experimental teachers used the Central Questions and thinksheets throughout the Matter Unit. Lessons proceeded as follows: (a) After a general discussion, students recorded on their thinksheets their own ideas about the answers to the relevant Central Question for each lesson; (b) during reading, students looked for and recorded textbook answers to the Central Question on their thinksheets; and (c) after reading, students discussed their own thinking about answers to the Central Questions and what they learned from reading their science textbooks.

Control. Teachers in the control classes taught the Matter Unit in the way they had always done. Their instruction, like that of the two teachers in the experimental group, consisted of using the Matter Unit in the text as the basic curriculum unit, and then supplementing information in the text with text-based laboratory activities. A typical lesson consisted of: (a) an introduction to the topic for that lesson or a review of yesterday's lesson, sometimes a hands-on activity; (b) an oral reading of the text, done as a whole-class activity; and (c) a question and answer session based on the questions at the end of the lesson.

The four teachers had taught together as a team for several years. When told about the Hawthorne effect, one teacher commented that the team was used to being rather competitive in their teaching. The two experimental teachers agreed not to provide control teachers with information about the experimental treatment. Later, interviews and observations with experimental and control teachers confirmed what they had agreed to.

Teacher training. The experimental teachers were trained to use the PKMI strategy in several ways. Videotapes of PKMI strategy lessons conducted by the investigators were viewed by the experimental teachers. Audiotapes of other lessons using the strategy were also reviewed. A handbook was developed by the investigators in which five scripted lessons introduced teachers and students to the ideas central to the PKMI strategy. The experimental teachers studied the handbook. One of the investigators modeled the first lesson from the handbook for both classrooms. Thereafter, this investigator talked to teachers and answered questions they had as they taught lessons from the handbook. Training time for the experimental teachers was approximately 5 hours.

Procedure

Several procedures were used to control for time and task variables. All teachers began the unit on matter at the same time, and paced their instruction similarly so that students were on the same lessons at approximately the same time, and all taught science at the same time during the morning. Additionally, all used the same text-based laboratory activities to supplement the instructional unit.

Approximately 1 week before beginning the study, the investigators administered a pretest to all students. This same test was administered at the completion of the unit, approximately 8 weeks after the beginning of the study. The test was readministered as a delayed posttest 8 weeks after the completion of the unit. Informal analyses of students' responses to the test taken at different times suggested that students were not learning the test. In addition, students had no corrective feedback to their responses, and a minimum of 8 weeks separated each testing session.

Qualitative data were collected to supplement the test data. Two observations were made of experimental and control teachers to determine to what extent the experimental teachers used the PKMI strategy effectively and whether experimental or control teachers were "teaching to the test." In addition, biweekly interviews were conducted with the experimental teachers. Thinksheets were collected from the experimental teachers and used to corroborate data collected through observations and interviews.

Assessment and Scoring

Students' knowledge about matter was assessed through an open-ended 10-item test called the *Physical Science Concept Inventory* (PSCI) designed by the investigators using procedures established by Anderson and Smith (1986). Because the items on the PSCI required students to apply knowledge they had about matter, they could not simply recall text in a rote manner; they had to make fundamental changes in their thinking about matter to respond correctly. Thus the test assessed students' learning from text rather than simply comprehension of text (Kintsch, 1987). For example, the following item assessed students' abilities to apply information they learned about changes in the state of matter (an application of the Central Question: "What happens when water freezes/evaporates?"):

> If you poke a finger into a glass of water your finger goes right into the water. If you try to poke your finger into a piece of ice, your finger probably won't go into the ice at all. Why do you think your finger will go into water but not ice? Use your ideas about what water and ice are made of.

The test provided baseline data about students' naive conceptions of matter as well as changes in their thinking as a result of the instructional unit.

Procedures for scoring the PSCI followed those established by Anderson and Smith (1986). Scoring procedures assessed whether students' responses reflected scientifically accurate conceptions about three issues relating to the Matter Unit: the structure of matter, changes in the state of matter, and chemical changes. Each issue corresponded to one of the Central Questions.

Two categories were created for students' responses, a scientifically accurate category and a naive category. One example of a scientifically accurate response was: "Water is liquid and the atoms in a liquid move around because there is more space than in ice (solid). In ice atoms barely move around." An example of a student response coded as a naive conception was: "Water is thin and easy to go through. When water freezes and becomes ice, it is thick and hard and you can't go through it." This response was coded as naive because it is basically a repetition of the description of the phenomenon, not an explanation of why the phenomenon occurs.

Students' responses for the 10 items were categorized and coded by one of the investigators and a research assistant. Weights were given for scientifically accurate responses, and scores reflecting the sum of the weights for each issue were computed. Twenty percent of the tests were recoded by either the investigator or the research assistant. All coded categories had at least 75% agreement between the two coders, with the total sample of coded categories averaging 92% agreement.

RESULTS

An analysis of covariance was conducted using a 2 × 3 repeated measures design. Pretest scores served as covariates and the PSCI as the dependent measure. Percentages of students holding scientifically accurate conceptions about matter were calculated using pretest, posttest, and delayed posttest scores for each of the three issues, the structure of matter, changes in the state of matter, and chemical changes. Means and standard deviations are reported in Table 1. At the completion of the unit students in the experimental group held more scientifically accurate conceptions about matter than students in the control group $[F(1, 100) = 4.23, p < .05]$. The raw scores for both experimental and control groups decreased slightly after the 8-week delay, but the

Table 1

*Means and Standard Deviations for Numbers of Issues for Which Subjects Held Scientifically Accurate Conceptions**

Test Time	Experimental	Control
Pretest		
M	.44	.36
SD	.60	.67
Posttest		
M	1.27*	.87
SD	1.01	.93
Delayed Posttest		
M	1.17*	.81
SD	.97	.89

Note: Total possible score = 3.0.
*$p < .05$.

experimental group continued to significantly outperform the control group [$F(1, 100) = 3.95$, $p = .05$].

Percentages of students holding scientifically accurate conceptions are reported in Table 2. These data suggest that many students from both groups maintained their naive conceptions about matter after instruction—either with or without the PKMI strategy. At the end of the unit over 50% of the experimental students still did not demonstrate evidence of scientifically accurate conceptions. This increased to almost 60% on the delayed posttest. Corresponding figures for the control group were about 67% at the end of the unit and 66% after the 8-week delay.

DISCUSSION

Results suggest that the PKMI strategy was somewhat more effective than traditional instruction in changing students' thinking. These results were obtained with a minimum of teacher training. Additionally, they were obtained using a conventional science text that has been found to be ineffective in helping students learn difficult science concepts (Roth, 1985). Although we cannot determine from the data gathered exactly why more students did not change their naive conceptions, we do have qualitative data that allow for some speculation about possible difficulties that occurred in the experimental group.

Qualitative data seem to suggest that more students in the experimental group may not have changed their naive conceptions because they did not have an adequate knowledge base to do so. The problems appeared to be procedural and substantive as well. We know from observations and responses on the thinksheets that the PKMI strategy was not always carried out effectively. Individual interviews with experimental teachers indicated they had an excellent understanding of the PKMI strategy, and were positive about using it. But it also appeared that they did not always present scientifically accurate and complete explanations to the Central Questions, and did not adequately monitor students' individual responses on the thinksheets to ensure that students wrote down scientifically accurate explanations to the Central Questions. As a result, students did not always identify what their own everyday ideas were or what the scientific ideas were. More importantly perhaps, students did not always record com-

Table 2

Percentages of Students Holding Scientifically Accurate Conceptions on Matter Issues

	Issue								
	Structure of Matter			Change of State			Chemical Change		
Group	Pre-test	Post-test	Delayed Posttest	Pre-test	Post-test	Delayed Posttest	Pre-test	Post-test	Delayed Posttest
Experimental	18.9	51.9	59.6	22.8	53.9	44.2	5.3	38.5	21.2
Control	10.7	38.1	44.2	23.2	32.7	25.0	1.8	33.3	25.0

plete and thorough scientific explanations. It could be that adequate scientific explanations were available and students did not record them or that adequate scientific ideas were simply not available. Our individual interviews with teachers, our observations, and students' responses on the thinksheets together seem to indicate that teachers may not have had the knowledge base to lead students to complete and appropriate responses.

It is clear that teachers' knowledge of content itself is an important factor in students' learning of content, and that content knowledge is an important factor in using the PKMI strategy. In this sense, content cannot be separated from process; the strategy is tied into the content. We did not access teachers' content knowledge, but we think it is an extremely important variable, especially in the learning of difficult science concepts. It may well be that teachers cannot make up for their lack of knowledge of content, especially with limited or no help from conventional science texts.

This study is part of recent research efforts to evaluate the effects of prior knowledge when that knowledge consists of naive conceptions. Many of the studies are so recent that they have not made their way into the research literature (e.g., Alvermann & Hynd, 1988; Dole & Smith, 1987; Maria, 1987, 1988; Marshall, 1988). Together, the studies have had mixed or limited success in changing students' thinking about science concepts. Yet, this body of reading research is entirely consistent with research in science education (see, e.g., Clement, 1982; Gunstone & White, 1981).

As Posner, Strike, Hewson, and Gertoz (1982) and Driver and Erickson (1983) forcefully point out, helping students see how their ideas are inconsistent with what they read or are taught and assisting them in developing new conceptual structures is a difficult task. Much research needs to be conducted with the PKMI strategy and other instructional strategies, with textbooks, and with teachers before we can say with confidence that we have effective ways of helping students learn from the science textbooks they read.

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STUDY STRATEGIES FOR CORRECTING MISCONCEPTIONS IN PHYSICS: AN INTERVENTION

Donna E. Alvermann and Cynthia R. Hynd
University of Georgia

Despite effort expended by instructors and students in college level learning strategy courses, there is rarely any transfer of what is learned in those courses to regular coursework (Schallert, Alexander, & Goetz, 1988). Traditionally, college level reading courses have focused on isolated skills instruction, which has little or no application to students' regular coursework (Walker, 1983).

In the past 5 years, however, there has been movement away from an isolated skills approach toward a more content-based approach in college reading programs. Nist and Simpson (1987), for example, describe a content-based approach to improved learning from text that has enabled developmental studies students exiting that program to compete favorably with their regularly admitted peers. In this approach, students are taught a repertoire of study strategies which they can apply independently in learning from text. The present study investigated how effectively students applied those strategies to a complex science text.

Changing students' naive explanations of complex scientific phenomena, especially when these explanations have served them well in the past, presents a challenge to individuals interested in instructional research. Attempts to effect conceptual change through hands-on-science activities (Champagne, Gunstone, & Klopfer, 1983), problem solving (Hewson & Hewson, 1983), peer interaction (Howe & Durr, 1982), and textual manipulations (Gordon & Rennie, 1987; Maria & MacGinitie, 1982; Roth, 1985) have met with varying success. As Anderson and Smith (1987) have noted, students may be able to perform successfully on tests of declarative knowledge about a particular science concept without understanding how to apply the concept in everyday life.

Changing students' naive conceptions may be particularly difficult if they have put considerable effort into learning what they believe is the "correct" explanation and have developed a deep-seated, affective commitment to their explanation (Marshall, 1986). In such instances, it may be necessary to create instructional conditions that enable students to become dissatisfied with their existing conceptions (Posner, Strike, Hewson, & Gertzog, 1982). Results of recent research on prior knowledge activation and refutation text (or text that specifically calls attention to incorrect information) suggest the importance of helping students become dissatisfied with their naive theories (Alvermann & Hague, 1989; Hynd & Alvermann, in press). Even more promising is research by Dole and Smith (1987), suggesting that showing students *how* to study important information may result in conceptual change learning, at least among elementary school populations (Maria, 1988).

The present study also investigated effectiveness of a study condition incorporating a prior knowledge activity developed by Hynd and Alvermann (1986) with a learning chart modeled after the thinksheet developed by Dole and Smith (1987). We modified the thinksheet to develop a heuristic that would help students identify information in a text known to conflict with their existing naive conceptions about motion theory. The resulting learning chart, as we called it, also showed students how to study the correct information using rehearsal techniques they had learned in the study strategies course. According to students in the Schallert et al. (1988) study, it is this emphasis on *how* to study and the distinction between knowing *how* and knowing *what* that is missing in most college level instruction.

METHOD

Subjects

From a pool of 127 college freshmen enrolled in their second of three developmental reading classes, 56 students were eligible for inclusion in the final data analysis. Eligibility rested on having demonstrated naive conceptions about Newton's laws of motion during a pre-experimental testing session and having completed all tasks during each of two experimental sessions. Subjects were enrolled in developmental reading classes because of low (less than 2.0 on a 4.0-point scale) predicted college grade point averages. The prediction equation used took into account subjects' SAT scores and their high school grade point averages. At the time of the study, most subjects had met the exit criteria for the developmental program on the Basic Skills Exam, a state-mandated reading achievement test. However, they had failed to meet the exit criteria for a previous developmental reading course, which had required them to demonstrate ability to study for and pass tests on lengthy college level content area texts. All subjects had been taught study strategies as part of their regular classwork in the developmental reading program for one and one-half quarters prior to their participation in the study. Thirty-nine of the subjects reported having had no physics courses, 16 had had physics in high school, and one student did not respond to the question.

Procedure

Two weeks after students were pretested on their knowledge of Newton's laws of motion, those who held incorrect knowledge of those laws were randomly assigned to one of six groups (two levels of activation crossed with three levels of the treatment variable). In the activation condition, students were required to draw the trajectory of a marble shot off a table top and to explain the reasoning behind their drawing. In the nonactivation condition, students completed a time/space relativity problem having nothing to do with projectile motion. All students then read a text refuting their naive conceptions of projectile motion by contrasting them with Newton's laws of motion. (For an example of the text see Hynd & Alvermann, 1986.)

After reading the text, students in the Free Choice Study condition were directed to choose any method of studying they preferred to prepare for a short-answer and true/false exam the following day. Students in the Explicit Study condition were told to prepare for a short-answer and true/false exam by completing a learning chart that consisted of several columns in which students were to (a) correct, in writing, three common misconceptions about projectile motion; (b) list the strategies they would use for studying the correct information (examples of strategies were provided on a separate handout); (c) describe how they had actually used the strategies to learn the correct information about projectile motion; and (d) record the time they spent studying the correct information. Students were familiar with all rehearsal strategies, having practiced them throughout the quarter. Students in the Control condition were also told they were preparing for a short-answer and true/false exam the next day. During the allotted study time, the controls were engaged in a word scramble activity and a word search puzzle involving vocabulary from the text they had read.

On the following day, all subjects received the study materials from the previous day (but not the text itself) so they could spend the first 10 minutes of the period reviewing their own work in preparation for the exam. At the end of 10 minutes, they were required to complete a 3-minute buffer activity to control for short term memory effects. Then they completed the short-answer and true/false posttest, which they had expected, and an application problem posttest, which they had not expected. Finally, students in the Free Choice Study condition received written directions requiring them to recall and describe strategies they had used to prepare for the exam. They were provided a piece of paper that contained three columns: the first column was for listing a strategy (or strategies) selected; the second, for giving an example of how they used a strategy (e.g., rereading to find main ideas); and the third, for recording the approximate time they had spent using a strategy.

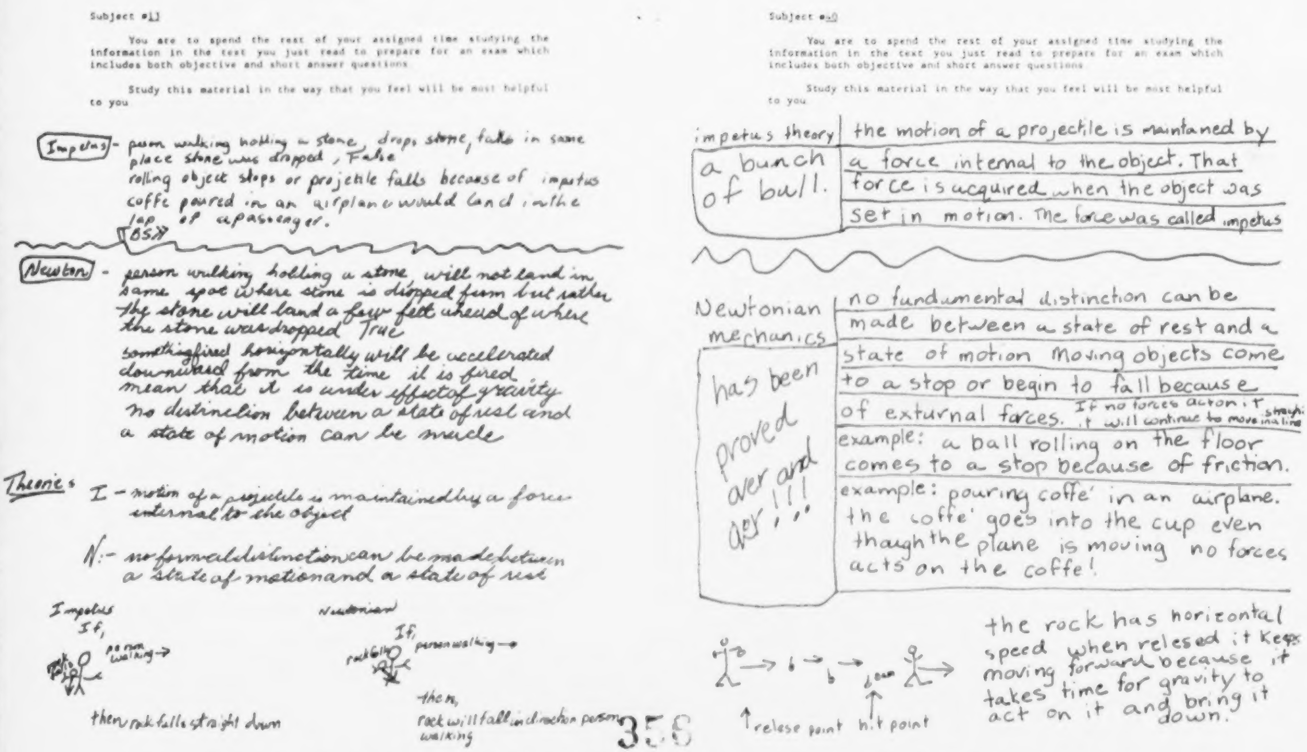
Scoring

The short-answer test was scored for correctness of information, with particular attention paid to any signs of lingering beliefs in impetus theory. No partial credit was awarded, and scores ranged from 0 to 5. Both researchers independently scored all short-answer tests. Differences in agreement were resolved through discussion. The true/false tests were scored against a scoring key, with raw scores ranging from 6 to 16 on the pretest and 4 to 21 on the posttest. Answers on the application problem posttest were scored by both researchers, with differences in agreement being resolved by discussion. No partial credit was awarded, and scores were reported as either 0 (wrong) or 1 (right).

RESULTS

Quantitative Analysis

Separate analyses of covariance were conducted on each of the two dependent measures, using the true/false pretest as the covariate. The assumption of equal slopes was met for each analysis. A chi-square analysis was used to determine if differences



Subject #13

You are to spend the rest of your assigned time studying the information in the text you just read to prepare for an exam which includes both objective and short answer questions

Study this material in the way that you feel will be most helpful to you

Impetus - person walking holding a stone, drops stone, falls in same place stone was dropped, False
rolling object stops or projectile falls because of impetus
coffe poured in an airplane would land in the lap of a pasenger.
BS!!

Newton - person walking holding a stone will not land in same spot where stone is dropped from but rather the stone will land a few feet ahead of where the stone was dropped True
somthing fired horizontally will be accelerated downward from the time it is fired
mean that it is under effect of gravity
no distinction between a state of rest and a state of motion can be made

Theories I - motion of a projectile is maintained by a force internal to the object

N:- no formal distinction can be made between a state of motion and a state of rest

Impetus
If,
person walking →
then rock falls straight down

Newtonian
If,
person walking →
rock falls
then,
rock will fall in direction person walking

Subject #40

You are to spend the rest of your assigned time studying the information in the text you just read to prepare for an exam which includes both objective and short answer questions

Study this material in the way that you feel will be most helpful to you

impetus theory | the motion of a projectile is maintaned by a force internal to the object. That force is acquired when the object was set in motion. The force was called impetus

a bunch of bull.

Newtonian mechanics | no fundumental distinction can be made between a state of rest and a state of motion Moving objects come to a stop or begin to fall because of externial forces. If no forces act on it it will continue to move in a straight line
example: a ball rolling on the floor comes to a stop because of friction.
example: pouring coffe' in an airplane. the coffe' goes into the cup even though the plane is moving no forces acts on the coffe!

has been proved over and over!!!

relese point
hit point
down

the rock has horizontal speed when relesed it keeps moving forward because it takes time for gravity to act on it and bring it down.

Figure 1. The study strategies used by subjects #13 and #40 in the Free Choice condition.

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existed on the application problem posttest. Finally, subsets of data were analyzed qualitatively to provide a better understanding of the obtained results.

On the short-answer test, the results of a 2 × 3 analysis of covariance indicated no statistically significant differences for Activation [$F(1, 49) = 1.16$, $p > .28$], Treatment [$F(2, 49) = 2.45$, $p < .10$], or the interaction between Activation and Treatment [$F(2, 49) = 1.26$, $p > .29$]. On the true/false posttest, statistically significant differences were found for Treatment [$F(2, 49) = 3.42$, $p < .05$], but not for Activation [$F(1, 49) = 0.17$, $p > .68$], nor for the interaction between Activation and Treatment [$F(2, 49) = 1.72$, $p > .19$].

To determine which of the three treatment groups were significantly different from one another, Tukey's procedure was used on the adjusted means. Students in the Free Choice Study condition ($\bar{x} = 16.01$) performed significantly better than those in the Control group ($\bar{x} = 13.35$). The difference represented an effect size equal to 0.76 standard deviation units (Cohen, 1977). No statistically significant differences were found between the Free Choice Study condition ($\bar{x} = 16.01$) and the Explicit Study condition ($\bar{x} = 14.89$), nor between the Explicit condition and the Control condition ($\bar{x} = 13.35$).

No statistically significant differences were found for the application problem posttest. The obtained chi-squares for Activation [$\chi^2(1) = .10$], Treatment [$\chi^2(2) = 2.65$], and Activation × Treatment [$\chi^2(2) = .62$] all had probabilities greater than .25.

Qualitative Analysis

Several content analyses of students' written products were conducted to trace effects of the different study strategy treatments on students' learning. For example, in an analysis of strategies reported and/or demonstrated by the 20 students who were given freedom of choice in how they studied the complex science passage, we found no student reported and/or demonstrated using less than two study strategies. Students reported 14 strategies (see Table 1). The most popular strategy was "rereading." Although college reading specialists typically regard rereading as an ineffective strategy (e.g., see Nist & Diehl, 1985), students in this study used it often. For some students, at least, rereading appeared to facilitate the study of key ideas. For example, one student described his rereading as being "selective." He said he only reread important parts and tried to think about and remember them. Further, all students who used rereading did so in conjunction with at least one other strategy.

In a separate analysis of the use students in the Free Choice Study condition made of these strategies, we found that, on average, students in this study condition answered correctly 4.65 more questions on the true/false posttest than they had on the true/false pretest, which consisted of the same questions. By comparison, students in the Control condition, on average, showed a gain of only 1.39 questions from pretest to posttest.

A content analysis of two students' study strategies in the Free Choice Study condition revealed how combining note taking with picture drawing helped them overcome their misconceptions. Subjects #13 and #40 took notes by contrasting impetus theory with Newton's theory of motion, and then drew simple stick figures to

Table 1

Frequency of Study Strategies Reported and/or Demonstrated by Students in the Free Choice Group

Study Strategy Type	Number of Reported and/or Demonstrated Uses
Rereading	18
Underlining	9
Notetaking	9
Annotating	6
Finding Examples	5
Mapping	4
Rehearsing	3
Using Mnemonic Devices	2
Skimming	2
Locating Key Vocabulary	2
Drawing Pictures	2
Imaging	1
Rewriting in One's Own Words	1
Using Common Sense	1

illustrate an important concept in the text (see Figure 1). Both subjects also answered five more questions correctly on the true/false posttest than they had on the pretest. Subject #13 answered all short-answer questions correctly; Subject #40 missed one. On the application problem posttest, both subjects demonstrated they had learned that a projectile launched horizontally will take a trajectory resembling a parabola. Neither had had a physics course in high school or college. Subject #13 spent a total of 23 minutes using the study strategies of her choice, while Subject #40 spent a total of 18 minutes.

By way of contrast, Subject #30 (a member of the Explicit Study condition) and Subject #50 (a member of the Control condition) did not show similar gains in learning. Subject #30 missed the same six questions on the true/false posttest that he had missed on the pretest. Subject #50, with the exception of three questions, missed the same nine questions that she had missed on the pretest. Both answered only three of the five short-answer questions correctly. An inspection of all the students' learning charts in the Explicit Study condition revealed that nearly a third of them contained references to impetus theory, the theory they were supposed to refute. Finally, neither Subject #30 nor Subject #50 answered the application problem correctly. Both indicated they believed the dissipation of an internal force imparted at the time of launch (i.e., the belief in impetus theory) caused the projectile to fall to earth. Subject #50, but not #30, had taken a physics course in high school.

DISCUSSION

It is encouraging to find that students who had been taught to use a variety of study strategies for one and one-half quarters of their freshman year chose to use them and did so effectively. At the same time, it is difficult to explain why students in the Explicit Study condition, who had been exposed to the same study strategies for the same period of time as students in the Free Choice study condition and who were directed explicitly to use one or more of those strategies in the learning chart, did no better than students in the Control group. We surmised that students in the Explicit Study condition were confused about the procedure for completing the learning chart or lacked practice in using it. However, results of a post hoc study (Hynd, 1988) involving a similar group of students did not support our hunch. Also, we knew from Maria's (1988) study that fifth graders who were given no practice in use of a thinksheet (which was the model for our learning chart) still benefited from using the thinksheet. It seems plausible, therefore, that factors other than lack of practice played a role in our findings for the Explicit Study condition.

One explanation for why students in the Explicit condition were unable to benefit from their repertoire of study strategies was that the learning chart got in the way. Although the chart was intended as a simple heuristic for helping students discover discrepancies between their own thinking and that of the scientific community, in reality it appeared to hinder learning. Because students were expected to complete the chart independently, without benefit of discussion or feedback on the accuracy of the information they selected to study, they often studied the wrong information. Hence, any potential advantage of strategies they were directed to use may have been neutralized. Future research involving the learning chart would do well to include opportunities for peer interaction, similar to what Howe and Durr (1982) described.

Students in the Explicit Study condition may have believed that impetus, and not Newtonian, theory was the important theory to remember. The term *impetus theory* appeared in the first column of the learning chart along with three typewritten misconceptions commonly associated with this theory. Perhaps students in the Explicit group were misled by what Gillingham, Garner, and Wright (1988) refer to as "seductive details," or information that catches the eye but is unimportant (see also Thorndike, 1917). Earlier work by Brown and Smiley (1978) and Winograd (1984) suggests that immature or incompetent readers lack insight into information that is important to extract for extra study.

Or, as developmentally immature readers, the students in the present study may have tried to complete the chart by simply matching on the words *impetus theory*. That is, they may have focused on those two words and then searched the text for the same words. Once found, the information surrounding the words *impetus theory* may have been copied onto the chart even though directions accompanying the chart stated that students were to find ideas in the text that contradicted impetus theory. It is important to note that many students in the Free Choice Study condition recognized the contrasting nature of the two theories and were able to label correct and incorrect theories appropriately.

Finally, the learning chart may have been ineffective as a heuristic for getting students to correct their misconceptions about motion theory because once they had spent time copying information from text they were committed to studying it, regardless of whether it was accurate or not. Marshall's (1986) work on affect and misconceptions suggests that strong personal efforts on the part of learners to understand an idea may intensify their commitment to the idea. Future studies might include measures for studying the role of affect in students' use of the learning chart.

In terms of the implications that can be drawn from the present study, it appears that college level developmental readers who have had training in a variety of study strategies and who are given free choice in the use of these may be able to comprehend and learn from complex science materials on their own. It also seems likely that under certain study conditions, attention may be focused inadvertently on incorrect information. This may confuse rather than help students who are having difficulty learning from text.

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HOW FIGURATIVE LANGUAGE COMMUNICATES "INEXPRESSIBLE" MEANING

Sarah J. Webb
University of Science and Arts of Oklahoma

Diane L. Schallert
University of Texas at Austin

Current conceptions of the nature of language and of the role of language in structuring reality naturally foster an interest in how figurative language is processed, and why and how it is used in communication. If we accept a characterization of comprehension as a constructive process by which readers construct meaning in their interaction with print, then figurative language poses a particularly interesting problem because it presents the reader with anomalies to resolve which occasion a deeper involvement in meaning construction, one in which experiential memory (Ortony, 1975) and a-rational mentation (Rogers, 1973; Rothenberg, 1984) play a larger role than in literal language. As a result, figurative language may evoke in readers' construction of meaning that is inexpressible, or much more difficult, to express in literal language.

Our focus in this paper is exactly on that quality of figurative language, its use in situations when a more literal expression cannot be found or cannot capture completely the meaning that someone wants to express. The conclusions we discuss here were reached as part of a larger study which described the production and use of figurative language with special attention to its role in generating insight. A group of skilled writers were observed and interviewed as they engaged in a variety of self-chosen writing tasks that they and we had determined in advance would likely be occasions for discovering new ideas. In line with work by Pollio, Barlow, Fine, and Pollio (1977), Pardee (1983), and Ortony (1975), our broad focus was on how metaphors and other figures were produced and used, and why they were used. We found that our informants used figurative language for a number of purposes. For an audience of reading researchers, however, the results pertaining to inexpressibility are particularly interesting because they imply an implicit theory of reading held by our informants that requires readers to be active participants in communication. Thus, models of reading that emphasize the similarities to writing, such as those of Tierney and Pearson (1983) and Kucer (1985), are invoked in our description.

METHOD

Subjects

Four honors freshmen, one senior, one graduate student, and one professional writer (6 women, 1 man) served as informants for this study. All participants wrote in English, but for 3 of them, Spanish was their first language and English a fluent but clearly second language. These subjects were included because we were interested in whether nonnative control of a language would provoke a particularly interesting use of figurative language. In fact, except for some interesting points not related to the theme we are pursuing here, our data did not point to any systematic differences attributable to language groups.

Writing Tasks

Recruitment materials specified that the informant be engaged in an epistemic writing task, one through which he or she hoped to discover new knowledge, achieve insight, or solve a problem. Most academic writing holds the possibility of such new learning, and six of the tasks observed were in response to course or academic program assignments. Preliminary interviews confirmed the epistemic nature of the writing the participant had chosen. Because in epistemic writing, the writer often is attempting to come to terms with tentative ideas and sometimes with material that is vague or emotional, restricting the tasks to epistemic writing may well have meant that the problem of inexpressibility arose more frequently than if the choice of tasks were entirely free. However, the process by which meaning was communicated was not likely to be affected by this restriction.

Thus, our writers were allowing us to observe them as they wrote on tasks that they faced in their academic and/or professional careers. In a subsequent analysis of these tasks, we saw that they spanned two continua: Janet Emig's (1971) *reflexive* writing (self-oriented, contemplative) to *extensive* (outward oriented) continuum and James Britton's (1978) *transactional* to *poetic* continuum. Among the seven writers, tasks included two short stories, a literary essay, an analysis of a political event, a description of a personal problem, a philosophical essay, and a description of a stress reduction program.

Procedure

Informants wrote for at least 1 hour while they spoke their thoughts aloud into a tape recorder. They were interviewed immediately afterwards. In the interview, they were first asked to identify insights generated in the writing and to describe relationships between ideas. The interviewer then asked open-ended questions about processes theorized to be involved in figurative language (e.g., "Were there any places in the writing where you found it difficult to find words to express what you wanted to say?"). Then, for each novel figure, the interviewer asked the purposes accomplished by the wording and presented literal rewordings for the writer's reaction. It was only at this point that informants realized that the investigation dealt specifically with figurative language.

Data Analysis

Data came from three sources: the texts written during the observation session, the think-aloud protocols, and the retrospective, text-based interviews. Analysis generally depended more heavily on the texts produced and the text-based interviews than on the think-aloud protocols, which were used as a check on the accuracy of conclusions drawn from other data. The data were analyzed as case studies and the seven cases then compared for similarities and differences in purposes for figurative language use and processes of production. For this paper, we focus just on those purposes and processes that relate to inexpressibility.

In reducing data, we used a coding scheme based on categories that arose from the data themselves. This thematic analysis, based on a phenomenological research model described by Tesch (1980), took place in four steps: (a) recording first impressions of strong patterns in the data, (b) coding by organizing category, (c) identifying themes within categories, and (d) recombining themes into larger or differently defined categories. These final categories were examined in relation to the research questions. Table 1 gives a subset, those that related to the "inexpressibility" theme, of the categories that resulted.

To ensure that data were not distorted by the researchers' preconceptions, we sought counter examples which contradicted the patterns we saw developing. For example, much of one case study was devoted to analyzing how an informant with a particularly literal style used literal language to accomplish purposes for which other informants used figurative language. We also sought discrepancies in data from different methods of investigation. Discrepancies were resolved by questioning the informant further or by evaluating the likelihood of mistake or contamination. Data were emphasized which were confirmed by other data, which were grounded in examples from the text or reported in protocol without analysis, and which were stated with emphasis.

In identifying where figures were occurring in the writing, we used the University of Tennessee Research Group Training Manual for Identifying Figurative Language (Barlow, Kerlin, & Pollio, 1970). Samples of informants' texts were rated for figurativeness and novelty of figures by independent judges, one a Spanish-English bilingual and the other a native English speaker. Initial agreements on categorization for the selections as a whole were 75.4% on figurativeness and 84.8% on the novelty of agreed-upon figures. Disagreements were then resolved in conference.

RESULTS

Results presented here were culled from the extensive case and comparative studies described above. In Table 1 we summarize the degree to which each of our seven informants gave evidence for particular subuses of figurative language as they relate to inexpressibility. In what follows, we list our conclusions first as a set of separate statements. We then offer examples of the evidence that supported each statement. (Note that in reality we found them and the evidence for them to be intertwined throughout our data sources.)

1. A major purpose of figurative language is the communication of meaning that is inexpressible in literal language.
2. Figurative language communicates such meaning in an indirect way that requires reader participation in completing an open-ended meaning.
3. Writers guide the reader's construction of figurative meaning by contextual clues while retaining sufficient open-endedness to make the construction fruitful.

Figurative Language Used to Express the Inexpressible

Results indicated that the communication of meaning difficult to express in literal language was a major purpose for the use of figurative language. Such meanings were often holistic, diffusely emotional, conceptually new, partially conscious, or densely complex. One writer described evoking "an emotion that you know people are going

Table 1

Variations in Use of Figurative Language for "Inexpressibility"

	Patricia	Jorge	Eloise	Sally	Ana	Liz	Becky
Emotion	yes	no	no	yes	no	yes	yes
Pattern i.d.	yes	yes	yes	yes	yes	yes	yes
Subtlety	yes	no	no	yes	yes	yes	yes
New meaning	no	no	no	no	yes	no	yes
Ambiguity	yes	yes?	yes	yes	yes	no	yes
Holism	yes	yes?	yes	yes	yes	no	yes
Complexity	yes	no	no	no	yes	yes	yes
Mult. meaning	yes	no	yes	yes	no	yes	yes
Density	yes	no	yes?	no	no	no	yes
Uncons. reson.	yes	no	yes?	yes?	no	yes?	yes?
Symbolism	yes	no	no	no	yes?	no	yes

Key:

yes	Clear evidence exists of this objective either by direct statement or textual evidence
yes?	Weak evidence exists of this objective
no	No evidence exists of this objective
Emotion	Expressing emotion or trying to affect reader emotionally
Pattern i.d.	Articulating a pattern best expressed figuratively
Subtlety	Expressing nuances or vague, elusive meaning
New meaning	Representing radical new meaning
Ambiguity	Expressing ambivalence or ambiguity
Holism	Evoking or expressing holistic experience or meanings derived from holistic experience
Complexity	Representing complicated or contradictory meaning
Mult. meaning	Providing multiple connotations, denotations, associations
Density	Communicating dense, rich meaning
Uncons. reson.	Expressing or attempting to access unconscious association or resonance
Symbolism	Expressing symbolic meaning

to understand but that you can't put into words." Another said that she wanted the reader to recreate her story holistically, as if experiencing it: "You want [the readers] to forget that they're reading and to just be so absorbed . . . that they kind of experience it on an internal stage." She described working with her experiential memory, "taking it and translating it into linear language so that it can then be reconstituted in the receiver." One fiction writer described using figurative indirection to express subtle, multiple meaning: "You have so many layers of meaning. . . . You're being explicit about one layer, and the other layers are all implied." She expected readers to construct meaning in response to the implied "layers" as well as the explicit ones. All seven informants used figurative language to express meaning difficult to express in literal language.

Figurative Language Requires Reader Participation

In the interview writers stated their expectation that readers would construct meaning in response to figures which were left open to a variety of differing responses. An essay writer spoke of "trying to get . . . the most meaning I could into the fewest words. . . . And the way to do it would be saying something that's concrete enough that the reader could . . . interpret a lot of abstract thoughts into it." A fiction writer presented the reader with clusters of related figures whose meanings were ambiguous. She deliberately retained the ambiguity: "It's just like explaining the punch line to a joke. You know if it has to be explained then something's wrong. . . . People need to be able to draw their own conclusions and yet have those conclusions be pretty close to what yours were." Writers appeared to expect an approximate, personal correspondence to the meaning they represented. Such an idiosyncratic meaning allowed for the incorporation of personal associations, experiential memory, and unconscious or a-logical material.

Analysis revealed a variety of methods of indirection, including multiple semantic meaning, concrete representation of abstraction, a logical contradiction, vagueness, and the equating of patterns from different domains. More than one method might be used together, as when one informant, exploring an aspect of his personality, used a logically contradictory and vague idiomatic metaphor to represent a difficult meaning. This figure was useful in the beginning of his writing as he was trying to articulate an emotional experience with many aspects hazy to him. His first statements in the protocol used the figure "being myself": "I've noticed I'm not myself when I'm around certain people and I wonder why. It's—probably depends sometimes because I'm nervous. I'm nervous around some people more than others." After initial exploration of the idea, the literal abstraction "communication" began to supplant "being myself."

Multiple semantic meaning was evident in the double modality wordings used by one fiction writer in the synesthetic figure, "The pressure of late afternoon shocked her over-chilled flesh." The writer explained that "pressure" meant not only a physical feeling but "this sense" that her character "has to be . . . slapped around, forced." In this figure, three elements, "pressure," "shock," and "over-chilled flesh," present paired semantic meanings that relate to physical and emotional states, with one meaning more in focus than the other.

Sometimes a concrete particular served as an example of a more abstract meaning. With a series of exaggerations: "The tirade on punctuality your boss gave you when he finally showed up for the sales meeting, or your son purposely trying to incite you to child abuse are only half the reasons you feel 75 years old in the morning," one informant said that she "was trying to visualize for [her readers] the world of problems that are stress related."

Using one domain of knowledge to bring out certain aspects of another was one of the commonest techniques of indirection, used in 64.2% of novel figures. This strategy can be seen in metaphors such as "writing as a trigger" (the domain of literacy transferred to that of weaponry), a drawing of a process of policy revision (the domain of political decision-making transferred to that of geometric shapes), "reverse possession" (religious enlightenment transferred into the domain of the occult), and "pushed our hand" (political action transferred into the domain of cardplaying).

The fullest range of methods of indirection could be seen in a fiction piece dealing with a particularly inexpressible meaning, the changes in consciousness resulting from spiritual enlightenment. Metaphor was useful to this informant since it allowed her to transfer patterns from other domains to communicate an experience difficult to describe directly. Metaphors such as "reverse possession" or "drug trip feelings," when extended, communicated certain aspects of the experience. The informant also expressed her difficult meanings through concrete particulars which stood for abstractions, a strategy which we classified as metonymy. For instance, a character wandering at night stood for loss of control by the conscious self. A clock tower and bells for classes represented a temporal reality. Vague figures such as "being forgotten," which referred to a sense of alienation from God, were useful to communicate an emotional tone without implying detailed correspondences. For the most inexpressible meanings, however, the writer used oxymorons to create paradoxical oppositions. With an oxymoron such as "rather than totally losing themselves . . . they totally own themselves and as they didn't before" and "an uninterrupted flow of time, simultaneously infinite and a single point in time," logical resolution was impossible and the reader was forced to grope toward the reality indirectly indicated.

Writers Guide Readers' Construction of Figurative Meaning

Although the writers often stated that they did not want their meanings to be too "buttoned down," in the words of one informant, they knew they had to guide their readers' interpretation. Writers stated that they controlled the degree of open-endedness and the direction of interpretation through constraining context. One writer rejected a figure which she felt would require too much context: "It's a little too vague to explain itself. I could *say* it, but then I would have to develop it, and maybe . . . it would need more concluding thought work to show exactly what I mean. . . . If I didn't explain it, then it would mean nothing." To prevent misreading, a figure might be accompanied by a phrase which pointed out the most relevant aspects of a figure. For instance, in "The billboards looked charming and old-fashioned, like Barnum and Bailey posters from the 50's," the literal phrase "charming and old-fashioned" pointed out the aspects of equivalence which the writer intended to be consciously registered. Pairing of figures and extension of figures similarly restrained the possibilities for interpretation. For this purpose, one figure, "writing as trigger, not knowledge," which was cryptic as a phrase jotted down in planning, was changed in the draft to two extended figures: "However, literacy or writing, in this case, is a trigger toward understanding rather than knowledge itself. Because the writer is only an arrow (pointer) in the direction of the path of knowledge, the interpretation of where exactly this is pointing is crucial." Analysis of the texts showed that the reader was guided in the interpretation of the meaning of figures by a variety of contextual clues. These clues included the context of the piece as a whole, extension of the figure, multiple representation of metaphorical theme in figures which brought out different aspects of meaning, networks of figures, literal restatement, and phrases which preceded or followed the figure.

Interpretation of figurative language was only partially a phrase-level phenomenon. In one short story in which an interaction stood for something larger (metonymy), the writer described how she provided context at different places in her text to prevent misreading: "This whole passage where he's pressing her through the turnstile and he's taking over paying for them to get in could really imply that what's going on between them is that she's too passive and he's . . . dominating, . . . but I'm not going to reinforce it later on." Thus analysis of a writer's protocol and text revealed that full interpretation of meaning frequently required knowledge of distant portions of the text. The meaning of figures interacted. In fiction in particular, figures interrelated and reinforced each other throughout the piece. Figures sometimes provided large rhetorical structures. Macro-figures, or systems of extended figures, sometimes involved large portions of the text or the entire text. The short story alluded to above, for example, created a metaphorical parallel between the marriage relationship of a couple and their unsettling visit to a roadside snake farm. Its writer stated that she wanted the visit to "be an external representation of the relationship between this man and this woman. . . . It seemed to me like such an apt metaphor for a place this couple—Drew and Claire in this story obviously have a fairly closed relationship with each other and the hostility that's in this place is going to hook right in that and scare them." This macro-metaphor was reinforced by clusters of other figures which extended the basic metaphorical equivalence and explored different aspects of it. Four of the 7 informants used such macro-figures.

DISCUSSION

Writers write with certain expectations of their readers. What the writers in this study chose to do with their language is a direct reflection of their overt or implicit assumption that their readers would construct meaning in response to the writing and that figurative language would evoke a certain kind of meaning construction, the reader's personal version of the writers' "inexpressible" meaning.

The conclusions reached that relate to the inexpressibility thesis originally formulated by Ortony (1975) confirm a view of figurative language as holistic rather than analytic and one based on perceptual processes. In very few instances were our informants able to paraphrase language directly and literally, as predicted by substitution and comparison models of figurative language. Rather, informants appeared to create figures in holistic fashion by perceiving the common identity in a miscellany of particulars that included not only the semantic and conscious but also experiential and unconscious elements.

We want to end this report with a caveat. The results presented here are but of a small portion from a more extensive analysis that explored writers' use of figurative language in epistemic writing. The richness and complexity of thought and text that our informants revealed to us required a comparably rich and complex set of analyses, and in some ways are not satisfactorily captured by the three conclusions described and exemplified above. The topics our writers pursued and their reasons and self-knowledge revealed in their think-aloud protocols and interviews continually stretched and challenged us in our attempts to maintain a scientific rather than artistic or literary stance toward them. To the degree that we have succeeded, we believe that our results show writers responding in their text production to a model of the reader that is dear to most present-day reading researchers, a reader who actively constructs a personal meaning sensitive to the clues provided by the writer.

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YOUNG CHILDREN'S WRITTEN RESPONSES TO LITERATURE: THE RELATIONSHIP BETWEEN WRITTEN RESPONSE AND ORTHOGRAPHIC KNOWLEDGE

Diane Barone
California State University, Bakersfield

Comprehension of text has been the central issue when researchers have pursued studies of readers' oral or written response to literature. The response investigations have usually focused on the readers' influence (Anderson, 1977; Bartlett, 1932) or the text's influence (Mandler & Johnson, 1977; Thorndyke, 1977) on comprehension. Recently, because of a concern for research in naturalistic settings, the context of the students' response has been included in these studies (Galda, 1985; Hickman, 1983).

Generally older students have been the subjects of response research. This is particularly true when written response is the focus (Applebee, 1977). Applebee (1978) forged new territory, however, when he studied the oral responses of younger students. His book, *A Child's Concept of Story*, detailed the developmental responses discussed by students about a remembered favorite book. Other researchers, such as Hickman (1983) and Kiefer (1983), have followed this trend by studying the physical (e.g., hugging a book) and oral responses to literature by young children. This investigation departs from other research in that its primary concern is the *written* responses produced by primary grade children after their independent reading of stories or sections of narrative text.

The specific questions that framed the direction of the study were: (a) Could the students' written responses be sorted into categories similar to Applebee's? (b) Did age or gender relate to the form of the written responses? and (c) Was there a relationship between students' orthographic knowledge and the form of their written responses? The combination of orthographic knowledge and written response may appear to create an unusual partnership. However, because Henderson (1985) and Bear (1988) have described parallels between reading and writing behaviors and the stages of othographic knowledge, and because there is an hypothesized relationship between written response and reading and writing development, there may be a similar relationship between the stage of orthographic knowledge and the child's written response.

ADDRESSING THE QUESTIONS OF THE STUDY

Response Classification

Applebee (1978) classified children's oral responses about their favorite stories and described two levels of response. Level one was composed of the *retelling* and *summary* forms. These patterns were most often used by young children and were the least complex. Level two included *analysis* and *generalization* and was the preferred level of response for most adolescents.

In conjunction with descriptions of the forms of response, Applebee compared Piaget's stages of cognitive development to each form. Each successive form of response required more cognitive complexity. Applebee observed that young children's responses often centered on the literal aspects of the text, whereas older students considered abstract qualities of the text such as theme. He attributed these different response types to an underlying mode of thinking. Younger students were egocentric and used linear, one-to-one correspondence thinking which resulted in responses that directly paralleled the information provided by the story. Older students, who had developed beyond egocentricity, were able to process simultaneously different aspects of the story and their responses were more often interpretive.

Orthographic Knowledge

Edmund Henderson's work (1985), dealing with developmental levels of spelling or word knowledge, provided another means of understanding a student's choice of response form. Henderson described five stages of orthographic competence: Preliterate/Prephonetic, Letter Name, Within Word Pattern, Syllable Juncture, and Derivational Constancy (Henderson, 1985; Henderson & Templeton, 1986). Each successive stage represents the cumulative knowledge that students acquire about words. Descriptions of these stages are discussed below.

Preliterate. Characteristically, children at the Preliterate stage move from random scribbles and drawings to more finely differentiated "writing" in which letters or numbers represent words. There is no systematic relationship between the actual word and what is written. As children move to the end of this stage, designated as Prephonetic, they typically represent initial consonants and perhaps final consonants.

Letter Name. Within the Letter Name stage children use a linear, one-to-one correspondence strategy which is exemplified when they use the letter names to represent sounds. For example, "rain" might be spelled "ran" or "nose" as "nos." Their spelling strategy is to use one symbol for each sound.

Within Word Pattern. Children at the Within Word stage begin to examine the complexity of long vowel patterns. For example, "float" might be spelled "flote" or "floet" or even "float." These children have moved beyond a one-to-one correspondence (one symbol per sound) way of thinking and are considering the various pattern representations for long vowels. At this stage the concepts of sound/symbol relationships, visual representations of vowel sounds, and the usual placement of letters within words are considered simultaneously.

Syllable Juncture. Children at the Syllable Juncture stage have mastered short and long vowel patterns in one syllable words and are now examining the combination of syllables in polysyllabic words.

Derivational Constancy. At the last stage of spelling development, Derivational Constancy, words which occur frequently in reading and writing are spelled correctly; the majority of invented spellings are used with less frequently encountered words (Henderson, 1985).

Henderson (1985) also discussed parallels between writing behaviors and word knowledge. As would be expected, Preliterate spellers typically engage in pretend writing situations, often writing to accompany their pictures. However, their writing is difficult to read by the children themselves and the adults in their environment.

Bear (1988), in describing the writing of Letter Name spellers, indicated that their writing tends to be word-by-word and uses a one-to-one correspondence strategy. Within Word Pattern writers move away from word-by-word writing. They have increased power as writers as demonstrated by the ease with which they produce written products. Students at the Syllable Juncture or Derivational Constancy stages write fluently and are proficient at various genres of writing.

Henderson and Templeton (1986) synthesize the relationships between reading, writing, and spelling. They state:

> Learning to spell is an active process, not a passive one. Furthermore, it is a concrete process, not an abstract one. Progress always entails word knowledge derived from reading and from applying the knowledge through purposeful writing. Spelling is thus pivotal to both reading and writing: in this sense it is central to the meaning and acquisition of literacy. (p. 314)

This relationship between reading, writing, and spelling forms the basis for the central topic under consideration here: orthographic knowledge and its relation to the form of written response.

THE STUDY

The 24 subjects used in this year-long investigation were students in a mixed-grade (first, second, and third), mixed-ability classroom. The students within each grade level represented divergent academic abilities and socioeconomic backgrounds. The range in each grade level was from special education to academically talented students. There were also 3 students who were learning English as a second language. The students typically were enrolled in the classroom for 3 years.

Assessment of Spelling Stages

A qualitative 20-word spelling inventory (Bear & Barone, in press; Schlagel, 1982) was administered to each student. The inventory was designed to generate errors typical of each stage described by Henderson, and the results were used to place each child within one of the spelling stages. Stage of spelling was hypothesized to be a significant variable in the form of the children's written response. Interrater reliability was assessed using Spearman correlation ($r_s = .94$, $p < .00001$).

Written Response

The children were asked to write in a response notebook after independently reading a story or section of a narrative text. No specific directions were given to the students about the response that they might write after the first week of school. The teacher said on each occasion, "Write in your notebook after you complete your reading." During the first week of the school year, all of the students had two forms of response modeled by the teacher in a whole class presentation.

The first form demonstrated was a dialogue journal (Atwell, 1987; Fulwiler, 1987; Staton, 1987). The students wrote letters to the teacher concerning any element of their reading and the teacher responded to the content of their writing. An example of this form of response came from Anna's journal. She was writing about *Danny, the Champion of the World:*

> Dear Mrs. B,
>
> My favorite part in the chapter was when he said, "What are we doing, playing twenty questions?" I liked it because I thought that it was a very brave thing to do.
>
> Your student,
> Anna
>
> Dear Anna,
>
> I agree. It was a very brave thing for them to do. The keeper must have been very surprised by their questions.
>
> Mrs. B

This type of response allowed for a direct dialogue between the teacher and the student. Staton (1987) described these entries as "a responsive form of writing in which the student and teacher carry on a conversation over time, sharing ideas, feelings, and concerns in writing" (p. 47).

The next form of response modeled was the Double Entry Draft (DED; Berthoff, 1981, 1982, 1984). In *The Making of Meaning* (1981), Berthoff detailed the use of this form of dialectic response. She asked her college students to divide their notebook in half. On one side of the paper students recorded direct quotes, lists, and other pertinent information. On the other side, they recorded their thoughts about these notes.

An example of this type of response was taken from Sarah's notebook. She was writing in response to *Ramona Quimby, Age 8.*

DED

Sunday morning Ramona and Beezus were still resolved to be perfect until dinner time	I know why they were trying to do that. They didn't want to make dinner. That's why. Don't you think Ramona and Beezus are a little tricky?
teacher's comment	I think they are a lot tricky. I wonder if they will get out of cooking dinner.

No other forms of response were modeled for the students. Students chose these forms and they also chose less structured forms. These freer response forms often included retellings or summarizations of the story. After this one-time modeling of the two response structures, no direct or indirect instruction was provided as to the possible forms of response.

RESULTS

The ability of the raters to classify the written responses into the oral response categories of Applebee satisfied the first objective of the study. Only three responses of the total 1,762 were unable to be sorted. One response was a poem written by a second grader after reading a section of *Danny, The Champion of the World*. The other two responses were by a third grader and a second grader who posed questions about particularly confusing sections of *Danny*.

During a pilot study, the reliability of the rater's classification of the responses was determined. Three raters independently sorted 472 literature responses generated by the students into Applebee's forms of oral response. The Spearman correlation coefficient among the raters was .8748, $p<.0001$. This coefficient substantiated the clarity of the categories and documented the category agreement achieved among different readers.

The hypotheses regarding the relationship of age, gender, and spelling stage with the form of written response were investigated through quantitative methods. The data were gathered over three time periods throughout the year. At the beginning of each time period, the spelling inventory was administered.

Table 1 presents the results of the crosstabulation analysis. The modal score (column percentages) of those students with a designated spelling stage of 1 (Letter Name), fell in the "summary statement" category. Spelling stage 2 (Within Word) students most often chose to write analysis responses, closely followed by summary statements. Children within spelling stage 3 (Syllable Juncture) clearly preferred analysis responses. There were only two children in the class at the fourth spelling stage (Derivational Constancy) and this sample was clearly too small to represent the population of all students at this stage. However, these students also preferred analysis responses. The chi-square coefficient for the crosstabulation was significant at the .00001 level. The crosstabulation table indicates a relationship between spelling stage and response. Definite trends in response forms are evident for children at various levels of orthographic knowledge.

Other quantitative tests including Spearman correlations, t-test analysis, and regression analysis supported these results. The means of the scored literature responses of each child were the dependent variable in these tests. The Spearman correlations indicated that: (a) age was significantly correlated with the children's mean responses $r_s=.5228$, $p<.0001$ and (b) spelling stage was significantly correlated with the mean responses $r_s=.5690$, $p<.0001$. A t test was used to determine the gender relationship with written response. The t value of .74, $p=.465$ indicates that gender was not significantly related with the mean responses. These quantitative tests indicate that spelling stage had the strongest relationship to the mean responses followed closely by age. Regression analysis was then used to determine the relative strength of the variables. The goal of the regression tests was *not* to develop a causal model; rather it was to investigate the degree of association between the variables.

Table 2 shows the results of one of the regression analyses. Spelling stage and age were both significantly related to the criterion variable, written response. The gender variable was not statistically significant. The Beta weights, which provide information about the strength of the variables in their relation to written response, indicate that spelling stage has the stronger relationship to the form of written response. Age, a priori, was expected to have a positive relationship with the preferred type of written response, as older students were generally predicted to give more sophisticated responses (Applebee, 1978). The regression analysis supports the relationship between age and form of response. When regression analysis was applied in each of the time

Table 1

Crosstabulation of Response by Spelling

	Spelling Stage				
Response	(1) Letter Name	(2) Within Word	(3) Syllable Juncture	(4) Derivational Constancy	Row Total
(1) Retelling					
Count	63	129	35	4	231
Row (%)	27.3	55.8	15.2	1.7	13.1
Column (%)	23.0	15.9	6.2	3.6	
Total (%)	3.6	7.3	2.0	.2	
(2) Summary					
Count	137	290	152	38	617
Row (%)	22.2	47.0	24.6	6.2	35.0
Column (%)	50.0	35.8	26.8	33.9	
Total (%)	7.8	16.5	8.6	2.2	
(3) Analysis					
Count	74	385	344	66	869
Row (%)	8.5	44.3	39.6	7.6	49.3
Column (%)	27.0	47.6	60.7	58.9	
Total (%)	4.2	21.9	19.5	3.7	
(4) Generalization					
Count		5	36	4	45
Row (%)		11.1	80.0	8.9	2.6
Column (%)		.6	6.3	3.6	
Total (%)		.3	2.0	.2	
Column Total					
Count	274	809	567	112	1762
Total (%)	15.6	45.9	32.2	6.4	100.00

Table 2

Stepwise Regression Analysis with Mean Scores: Written Responses in Relation to Spelling Stage, Gender, and Age

						Regression Parameters		
Step	Variables	Beta	t score	P_t	R	R^2	F	P_F
1	Spelling	.550	5.181	.000	.550	.302	26.83	.000
2	Spelling	.384	3.232	.000	.612	.374	18.23	.000
	Age	.315	2.650	.010				
	Gender	.021	.201	.841				

periods separately, the following results were obtained: (a) In each time period, spelling stage alone was significant; (b) in the first and second time period spelling stage was the strongest variable, but in the third time period, age dominated spelling stage; and (c) gender was insignificant in every analysis.

DISCUSSION AND CONCLUSION

The means of the literature responses of each child were tested against variables thought to be influential in determining the sophistication of those responses including age, gender, and spelling stage. Although gender was never a significant variable, age and spelling stage were. The regressions supply the answer as to how powerful these variables are in their relation to the written responses. The regression table in general and the Beta weights in particular indicate a stronger relationship between spelling stage and the form of response produced by the students. The regressions in each of the time periods are relevant in forming the following conclusions: (a) When age has been used by other researchers (Applebee, 1985), it has really been a proxy for cognitive development; and (b) spelling stage represents a more appropriate measure of cognitive development. This result is similar to the findings of C. Beers (1980), J. Beers (1980), and Zutell (1980).

The fact that age was stronger than spelling stage in the third time period actually adds credence to the above conclusions. Cognitive development and age typically go hand in hand. In this study, it is also clear that as the students advanced to more sophisticated spelling stages, they experimented with diverse forms of response and became capable of selecting the response form that they determined was most appropriate for a particular section of text. The crosstabs and regressions by time period all support the conclusion that increased cognitive abilities, as measured by higher spelling stage, result in more complex and diverse responses. The greater variance in the form of written response weakens the relationship between spelling stage and response. However, this weakened relationship indicates the cognitive growth of the students as measured through their ability to select various forms of response.

The questions posed by this study have been addressed through the successful classification of the responses and through statistical analysis. First, the young children's written responses were sorted within Applebee's oral response categories with many of the responses being interpretive. This result is interesting because Applebee's research suggests that only adolescent students produce interpretive responses. The crosstabulation table indicates that the young students in this study often wrote such responses. These responses typically related personal experiences to similar events occurring within the story. The regression analysis further supports the results observed in the crosstabs. The regressions demonstrate a significant relationship between the variables spelling stage and age, and the form of the written responses generated by the students. This result adds a new dimension to Applebee's (1978) conclusions. Orthographic knowledge provides a more precise measure than age when attempting to define the expected form of written response.

Second, this study supports the young child's ability to write in response to independently read stories. In previous discussions concerning students' responses to literature (Applebee, 1977), only older students were included when writing was the mode of response. The writing in this classroom demonstrated that dialectic notebooks can be used with young children. The written dialogue that occurred as students read through text allowed them to move beyond literal comprehension to a more complete understanding of story through their written dialogues.

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CONSIDERATE TEXT: DO WE PRACTICE WHAT WE PREACH?

Jeanne Shay Schumm
University of Miami

John P. Konopak and John E. Readence
Louisiana State University

R. Scott Baldwin
University of Miami

Only a few years ago the question asked in reference to text comprehensibility would have been, "What is the readability of the text?" However, readability formulas (e.g., Dale & Chall, 1948; Fry, 1978) tend to seriously oversimplify the relation between text and the cognitive processes involved in reading comprehension. Based as they are on rigidly quantifiable factors such as word- and sentence-length, readability formulas tended to ignore, or at least to slight, the many qualitative attributes of text that influence readers' abilities to read and understand texts (Marshall, 1979).

As a consequence, within the last decade notions of *considerate* (Armbruster & Anderson, 1981) or *friendly* (Singer, 1986) text have emerged as conceptual frameworks for assessing and describing text comprehensibility. Unlike traditional readability formulas, metrics derived from these conceptual frameworks address the varieties of text-based factors which enable and encourage readers to construct meaning from text. Langer (1983) has described the main sets of categories common to many of the existing guidelines for gauging the considerateness/friendliness of text: (a) text organization, (b) explicatory power, (c) conceptual density, (d) metadiscursive structures, and (e) instructional aids. Considerateness/friendliness is thus a function of a more or less subjective evaluation of the degree to which an author incorporates in the text those characteristics shown to facilitate reader understanding. Today, we are much more likely to ask, "Is the text considerate?"

Our observations at conferences, combined with current research literature on text considerateness (e.g., Dreher, Singer, & Letteer, 1987), suggested to us that future textbook selection committees will be assessing texts for their considerateness instead of simply relying upon readability formulas. If this proves to be the case, then those of us who publish research in the field of literacy and reading should make every effort to formulate our own writing as models of considerate/friendly text.

Also, although a number of manuscript guidelines exist to evaluate professional/scholarly writing (e.g., Gay, 1981; *Publication Manual of the APA*, 1983), none of these guidelines are specifically designed to guide construction of considerate/friendly texts in scholarly writing. Scollon (1988) has shown how, in fact, the derivation and deployment of the hitherto approved form of such writing has sometimes served to conceal and obscure as much as it reveals.

The purpose of this study, therefore, was two-fold. Our primary purpose was to examine the extent to which professional writing of literacy scholars is consistent with their own recommendations for writing by others. Additionally, we supposed that such an examination would be important if it produced an instrument which could be used to suggest specific writing guidelines for the NRC membership, for editorial reviewers, and for aspiring scholarly writers.

METHOD

Sample

The sample consisted of all 32 articles derived from papers presented at the NRC 1987 annual meeting in St. Petersburg and accepted for publication in the *37th Yearbook of the National Reading Conference.* To assess the authors'—as opposed to the editors' and/or reviewers'—sensitivity to constructing considerate/friendly text, we evaluated the manuscripts which were submitted for initial review rather than final versions.

Materials and Procedures

We selected Singer's (1986) *Friendly Text Inventory (FTI)* as the model from which to develop our Considerate Text Inventory (CTI) for two reasons. First, its five superordinate categories incorporated the general issues identified as typical by Langer (1983); second, its 34 items suggested a comprehensive overview of relevant considerations. However, since the FTI was designed for use in school textbook evaluation, we modified the inventory to accommodate the somewhat different demands of professional writing-for-publication. There were three stages in the modification process.

The first stage of revision involved determining and operationalizing superordinate categories for the inventory. We retained three of the FTI's five major categories (organization, explication, and metadiscourse). We omitted two of the categories. The first, instructional devices, was judged irrelevant to *Yearbook* manuscripts. The second, conceptual density, seemed equally inappropriate because scholarly writing is characteristically compact. Finally, we elevated one subordinate category in the FTI, discourse consistency, to superordinate status.

Thus, the CTI includes four major categories defined as follows:

1. Organization—arrangement of information,
2. Discourse consistency—uniform presentation of information,
3. Explication—forthright statement of information,
4. Metadiscourse—author's direct comments to the reader to clarify, interpret, and apply the information.

The second stage was modification of individual inventory items. Some of Singer's 34 items were either not applicable (e.g., "text contains a logically organized table of contents") or were assumed given constraints of APA style (e.g., "text contains headings and subheadings that divide the text into categories that enable readers to perceive the major ideas''). On the other hand, the FTI did not include some items necessary for judging professional writing (e.g., ''study could be replicated from information provided''). Ultimately, our exclusions and modifications reduced the 34-item FTI to 22 items in the CTI.

The third stage involved alterations of rating categories and scoring procedures. Singer's FTI included the following categories with corresponding point values provided in the second parentheses: (a) Strongly Agree (1); (b) Agree (2); (c) Uncertain (3); (d) Disagree (4); and (e) Strongly Disagree (5). Scoring involved adding the rating values for each of the 34 items. All items are positive, therefore, a low score is a better score. A score close to 34 on the FTI suggests friendly text, whereas a score close to 170 indicates unfriendly text.

Several changes were made in Singer's scale. One rating category (Not Applicable) was added so that the new inventory could be adapted to a variety of article formats (research articles, position papers, reviews of research, etc.). We also rearranged the point values so that the most positive rating (Strongly Agree) was assigned the highest point value. The *Not Applicable* classification was assigned a tracking value of zero. Therefore, the Considerate Text Inventory included the following categories with corresponding point values provided in the second parentheses: (a) Not Applicable (0); (b) Strongly Agree (5); (c) Agree (4); (d) Uncertain (3); (e) Disagree (2); and (f) Strongly Disagree (1).

The following steps were followed to calculate and interpret a score on the CTI:

1. Sum the scores from all 22 items.
2. Subtract the number of zero scores from 22.
3. Divide the sum by the remainder to derive the mean score.
4. Scores closer to 5.0 indicate more considerate text.

After revising the FTI and operationally defining the items of the new instrument, the CTI was tested using articles published in the *36th NRC Yearbook* (Readence & Baldwin, 1987). Two of the authors applied the CTI to selected articles independently. The sample for this testing phase included research articles, position papers, and reviews of research. This was done to determine the versatility of the new instrument. Testing prompted minor revisions in the wording of some inventory items. Appendix A presents the final version of the CTI.

Finally, two of the authors used the CTI to evaluate 15 manuscripts from the *37th NRC Yearbook*, randomly selected from the pool of 32 accepted articles. In this step, both authors evaluated the same manuscripts. Interrater reliability was $r = .69$, $p < .01$; raters resolved differences through conferences. The remaining 17 accepted manuscripts were divided between two of the authors. The two raters independently completed the evaluations.

RESULTS AND DISCUSSION

Total Scores

The mean score for the 32 articles was 4.30. The scores ranged from 3.23 to 5.00 with a standard deviation of .44.

Individual Items

Table 1 presents rating percentages and frequencies for each of the 22 inventory items. As Table 1 indicates, items were frequently judged Not Applicable. This occurred for two general reasons. One was because of the type of article. For example, the inventory stipulates that Items 2 and 3 are not applicable for research reports (see Appendix). The other reason was because an element was not included in the paper and did not need to be. For instance, in a given article no new terms needed to be highlighted (Item 12), or no new theories needed to be explained (Item 14).

Because of the number of items rated Not Applicable in Table 1, this information was insufficient to determine an overall pattern of virtues and weaknesses of evaluated manuscripts on an item-by-item basis. Table 2, therefore, presents the percentage of articles that achieved model status (Strongly Agree) when the item was applicable. The mean of these percentages was 59.91 and the standard deviation was 17.96.

In evaluating manuscripts for relative strengths and weaknesses, we considered as *strengths* those items which were one standard deviation above the mean (77.87). For the evaluated manuscripts, items which showed strengths were: (a) Item 11—(text is not overly presumptuous about the prior knowledge of the reader; incorporates neces-

Table 1

*Rating Percentages and Frequencies for Each Inventory Item**

Item	NA	SA	A	U	D	SD
1	—	68.8(22)	21.9(7)	9.4(3)	—	—
2	75.0(24)	18.8(6)	3.1(1)	—	3.1(1)	—
3	75.0(24)	18.8(6)	3.1(1)	—	—	3.1(1)
4	—	46.9(15)	28.1(9)	12.5(4)	12.5(4)	—
5	—	50.0(16)	28.1(9)	12.5(4)	6.3(2)	3.1(1)
6	—	53.1(17)	34.4(11)	12.5(4)	—	—
7	—	46.9(15)	43.8(14)	6.3(2)	3.1(1)	—
8	—	31.3(10)	31.3(10)	9.4(3)	25.0(8)	3.1(1)
9	—	56.3(18)	28.1(9)	6.3(2)	9.4(3)	—
10	—	71.9(23)	18.8(6)	6.3(2)	3.1(1)	—
11	—	87.5(28)	9.4(3)	—	3.1(1)	—
12	62.5(20)	15.6(5)	9.4(3)	6.3(2)	3.1(1)	3.1(1)
13	21.9(7)	28.1(9)	34.4(11)	3.1(1)	12.5(4)	—
14	53.1(17)	25.0(8)	9.4(3)	—	12.5(4)	—
15	28.1(9)	40.6(13)	9.4(3)	6.3(2)	9.4(3)	6.3(2)
16	18.8(6)	34.3(11)	21.9(7)	9.4(3)	12.5(4)	3.1(1)
17	15.6(5)	62.5(20)	6.3(2)	12.5(4)	3.1(1)	—
18	3.1(1)	78.1(25)	18.8(6)	—	—	—
19	18.8(6)	25.0(8)	21.9(7)	15.6(5)	18.8(6)	—
20	18.8(6)	68.8(22)	3.1(1)	6.3(2)	3.1(1)	—
21	12.5(4)	65.6(21)	9.4(3)	6.3(2)	3.1(1)	3.1(1)
22	18.8(6)	65.6(21)	15.6(5)	—	—	—

Note. Total number of manuscripts = 32.

*Number in parentheses = number of articles.

sary background knowledge), (b) Item 18—(rationale, literature review, and so forth are consistent within framework and intent of paper), (c) Item 20—(style and presentation are consistent with purpose of paper), and (d) Item 22—(figures, and so forth, assist in making text comprehensible).

On the other hand, we designated as *weaknesses* those items which were one standard deviation below the mean (41.95). Item analyses considered to reveal weaknesses are described as follows:

> *Item 8*—(avoids using long, convoluted sentences). We recognize that sometimes it is necessary to use long sentences to express complex ideas. However, when too many unusually long sentences (e.g., 60-plus words) are included, comprehensibility is potentially inhibited.
>
> *Item 12*—(text highlights specialized/technical terms or concepts which may be unfamiliar to intended audience). In the evaluated manuscripts, authors tended to be considerate in terms of incorporating necessary background knowledge (Item 11) and, to a lesser degree, in terms of explaining new theories or concepts (Item 14). Authors did not, however, rely on typographical devices to signal the reader to specialized terms or concepts.

Table 2

Frequency of Item Applicability for Each Article and Percentage of Articles "Strongly Agree" When Item Applicable

Item	Number of Times Applicable	Percentage *Strongly Agree* When Applicable
1	32	68.8
2	8	75.0
3	8	75.0
4	32	46.9
5	32	50.0
6	32	53.1
7	32	46.9
8	32	31.3
9	32	56.2
10	32	71.8
11	32	87.5
12	12	41.7
13	25	36.0
14	15	53.3
15	23	56.5
16	26	42.3
17	27	74.1
18	31	80.6
19	26	30.7
20	26	84.6
21	28	75.0
22	26	80.8

Note. Total number of manuscripts = 32.

Item 13—(text indicates clear relation of methodologies/procedures to research questions/hypotheses). In many cases no clear justification was presented for why a particular procedure or method was used (to the exclusion of others).

Item 19—(study could be replicated from the information provided). Perhaps the greatest violation in this area was vague descriptions of subjects. In many instances, descriptions of methods, materials, and scoring systems were equally nebulous. Moreover, we considered it particularly inconsiderate for an author to employ a method in a study, but refer the reader to another source to find a description of the method used.

Categories

Table 3 presents rating percentages and frequencies for each of the four superordinate categories included in the CTI. Of the four categories, the articles evaluated exhibited the greatest strength in the areas of metadiscourse and explication. As the table indicates, a somewhat greater number of problems were detected in terms of organization and discourse consistency.

CONCLUSIONS AND IMPLICATIONS

The primary purpose of this study was to determine the degree to which the professional writing of reading scholars is considerate, or reader-friendly. In general, our evidence suggests that as a profession we could stand to practice more of what we preach. While at first glance it does appear that we are creating reader-considerate text, it must be kept in mind that the articles evaluated in this study were only those *accepted* for publication. These are the articles that should be considered exemplary in a discipline presumably schooled in the necessity of writing texts which model various aspects of text comprehensibility. Nonetheless, only one article achieved a perfect score (5.0); and overall, only 4 of the 22 items were identified as definite strengths. This happened in spite of the fact that most of the articles adhered to the current APA style guidelines.

A seeming limitation to this study is the page-length constraint on manuscripts submitted to the *Yearbook*. Authors may object that they cannot create a considerate paper given the length constraints required by the editorial guidelines. However, we discount this as a flaw. Authors are advised to use their professional judgment in submitting their manuscripts. If an author feels that his/her message cannot be com-

Table 3

Rating Percentages and Frequencies for Each Inventory Category

Category	*n*	NA	SA	A	U	D	SD
Organization	5	30.0(48)	40.6(65)	16.9(27)	6.9(11)	4.4(7)	1.3(2)
Discourse Consistency	4	—	46.9(60)	34.4(44)	8.6(11)	9.4(12)	.8(1)
Explication	8	25.0(64)	45.7(117)	14.8(38)	5.5(14)	7.4(19)	1.6(4)
Metadiscourse	5	14.4(23)	60.6(97)	13.7(22)	5.6(9)	5.0(8)	.8(1)

Note. n = Items per category.

municated effectively within the length guidelines of the *Yearbook*, then the NRC's submission mechanism encourages the author to offer the paper to *Journal of Reading Behavior*, where length limitations are not an issue. Thus we presumed that authors submitting papers to the *Yearbook* had judged them sufficiently considerate.

A secondary objective of this investigation was to construct an instrument which could assess the text considerateness of professional writing. Clearly this version of the CTI is prototypical in nature and future validation research is warranted. Indeed, further refinement of the instrument may result in higher interrater reliability scores. However, some rater variability may be inevitable due to such factors as prior knowledge of the topic or paradigm orientation.

We did find the CTI to be equally discriminating whether applied to formulaic research reports or to more descriptive and qualitative/theoretical studies. If we agree that our own writing should be at least as considerate/friendly as what we expect from textbooks, we could consider using or further adapting the Considerate Text Inventory to guide our own writing, to monitor and possibly improve the writing of novice researchers, and to serve as a tool for editorial reviewers in the field.

This study began by indicating that a changing perspective has been evolving toward measures of text comprehensibility, and we have argued that this issue has implications for literacy scholars. Given the challenge posed to conceptions of readability by more recent, qualitative assessment techniques, it is a question we should *continue* to entertain, for two reasons. First, as literacy professionals and teachers, we have a responsibility to model good writing just as, in our classrooms, we model good teaching behaviors and practices.

Secondly, but of no lesser importance, is the implication of our results for the troubled relation between research and practice. Reporting of research findings is often faulted for its apparent textual vagueness, as well as for its seeming detachment from the "real" world of the classroom. Harste (1988) has pointedly called our attention to teachers' resistance to the products of our research. It is possible, perhaps even likely, that some of that resistance stems from a perceived lack of accessibility in our writing. We are a profession of readers and writers, of communicators. We should not just be talking to, or writing for, ourselves.

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APPENDIX

Considerate Text Inventory

Article Title: ____________________

[NA = Not Applicable, SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree]

	NA	SA	A	U	D	SD
I. Organization						
1. Introduction contains a brief, clear statement of paper's purpose.	0	5	4	3	2	1
2. Introduction indicates text content sequence, for example, "There are three important conditions to consider. . . ." (NA on Research Report)	0	5	4	3	2	1
3. Introductions to sections contain thematic statements. (NA on Research Report)	0	5	4	3	2	1
4. Text is cohesive, overall and within sections, in unidirectional sequence.	0	5	4	3	2	1
5. Distinctions between super/subordinate categories and ideas are clear.	0	5	4	3	2	1
II. Discourse Consistency						
6. Grammatical and rhetorical connectives are appropriate and clear.	0	5	4	3	2	1
7. Content flows logically and consistently (e.g., conclusions are clearly constructed, or generalizations have adequate supporting ideas).	0	5	4	3	2	1
8. Author avoids using long, convoluted sentences.	0	5	4	3	2	1
9. Author avoids passive voice as much as possible.	0	5	4	3	2	1
III. Explication						
10. The rationale is clear and consistent with the theoretical framework.	0	5	4	3	2	1
11. Text is not overly presumptuous about the prior knowledge of the reader; incorporates necessary background knowledge.	0	5	4	3	2	1

APPENDIX (*Continued*)

	NA	SA	A	U	D	SD
12. Text highlights specialized/technical terms or concepts which may be unfamiliar to intended audience.	0	5	4	3	2	1
13. Where applicable, text indicates clear relation of methodologies/procedures to research questions/hypotheses.	0	5	4	3	2	1
14. Explanations of new or ideosyncratic theories/concepts are explicit.	0	5	4	3	2	1
15. Where appropriate, text employs examples, analogies, metaphors, similies, and so forth, to assist comprehension.	0	5	4	3	2	1
16. Where appropriate, text deploys examples that illuminate materials and methods.	0	5	4	3	2	1
17. Content is an accurate, current, and unbiased representation of state of knowledge in the field. (NA in Position Papers)	0	5	4	3	2	1
IV. Metadiscourse						
18. Rationale, literature review, theoretical framework, discussion, and conclusions are consistent within framework and intent of paper.	0	5	4	3	2	1
19. The study could be replicated from the information provided (i.e., methodologies and/or statistical procedures are adequately described or explained).	0	5	4	3	2	1
20. Author's style and presentation are consistent with purpose of paper.	0	5	4	3	2	1
21. Where appropriate, figures, tables, and other graphic displays are included.	0	5	4	3	2	1
22. When included, figures, and so forth, assist in making text comprehensible; are relevant, and are not redundant; and summarize important information.	0	5	4	3	2	1

Directions:
Sum the scores from all 22 items: ____________
Subtract the number of zero scores from 22: ____________
Divide the sum by remainder.
This text scored: ____________

Higher numbers indicate more considerate text.

YES/NO METHOD OF VOCABULARY ASSESSMENT: VALID FOR WHOM AND USEFUL FOR WHAT?

Thomas G. White
Kamehameha Schools/CDEE

Wayne H. Slater
University of Maryland

Michael F. Graves
University of Minnesota

Anderson and Freebody (1983) demonstrated that assessment of students' general level of vocabulary knowledge is possible with a simple yes/no test—a test on which students merely indicate by a check whether they know the meaning of each word. They found, moreover, that a yes/no test can be more valid than a standardized multiple-choice vocabulary test when both are compared to interview data.

As Anderson and Freebody (1981, 1983) suggest, a yes/no test may have several advantages over a multiple-choice test. First, it strips away irrelevant task demands that may adversely affect young and/or unskilled readers in particular. Second, it relieves the testmaker of the burden of preparing distractors and eliminates problems caused by poor distractors. Third, it permits testing of about twice as many words in a given period of time.

Teachers and researchers we have talked to about the yes/no technique sometimes express concern that students will overstate their vocabulary knowledge, checking "yes" for words they do not really know. However, Anderson and Freebody (1983) offer a workable solution: including nonwords on the test. It then becomes possible to estimate each student's proportion of words truly known, $p(\mathrm{K})$, from the following formula:

$$p(\mathrm{K}) = \frac{p(\mathrm{H}) - p(\mathrm{FA})}{1 - p(\mathrm{FA})}$$

where $p(\mathrm{H})$, the proportion of hits, is the number of "yes" responses to real words divided by the number of words on the test, and $p(\mathrm{FA})$, the proportion of false alarms, is the number of "yes" responses to nonwords divided by the number of nonwords on the test. The proportion of false alarms thus serves as a correction factor for an individual student's tendency to overestimate his or her word knowledge.

Yes/no tests ought to be extremely useful because of their practical advantages.

However, we were skeptical about the validity of yes/no tests before this study was completed. Anderson and Freebody's (1983) subjects were middle-class, white fifth graders. We wondered whether the yes/no technique would work as well with younger readers, unskilled readers, and economically disadvantaged or linguistically different youngsters—the very groups it ought to help. Drum's (1983) study had indicated that fifth-grade low achievers grossly overestimate their own vocabulary knowledge.

This study investigated the validity of the yes/no method of vocabulary assessment, comparing it to a nonstandardized multiple-choice test, for younger versus older elementary students, skilled versus unskilled readers, and mainstream versus nonmainstream students. First through fourth graders from three diverse school populations received a yes/no test, a nonstandardized multiple-choice test, and an individual interview covering the same words. Each of these was conceived as a measure of *reading* vocabulary; that is, a measure of the ability to both read and understand test words. Mean proportions and correlations among the measures were examined and compared across groups.

METHOD

Subjects

Subjects were from: School A, a suburban school enrolling middle-class white students who spoke standard English; School B, an inner-city school enrolling black, dialect-speaking and economically disadvantaged students; and School C, a semirural school enrolling dialect-speaking and economically disadvantaged Asian/Pacific students (see White, Graves, & Slater, in press, for a complete description of the populations). A total of 288 children were interviewed. Of the 288 interviewees, 283 took the multiple-choice test and 278 took the yes/no test.

Test Words and Materials

The 56 test words (see White et al., in press) were a stratified random sample drawn from the 19,050 most frequent words in the *American Heritage Word Frequency Book* (Carroll, Davies, & Richman, 1971). The strata were seven frequency blocks whose increasing size constituted a logarithmic scale. Blocks 1–7 contained, respectively, 150, 300, 600, 1,200, 2,400, 4,800, and 9,600 words. Eight words were randomly selected from each block.

Yes/no test. The yes/no test included, in addition to the 56 test words, 44 of the nonwords used by Anderson and Freebody (1983). Nonwords included: (a) decoding distractors which might be confused with a real word through error or inattention to spelling (e.g. *weast, robbit*); (b) pseudoderivatives which were nonoccurring combinations of real English morphemes (*observement, forgivity*); and (c) nonwords which fit neither of the preceding two categories (*terimet, calady*). Words and nonwords were presented in a numbered list with two blanks alongside each item under the words "yes" and "no" (in a "yes" column and "no" column).

Multiple-choice test. Each of the 56 items of the multiple-choice test consisted of a sentence with a blank (e.g., "You have to be very ———— when you cross the street") and four alternatives including the test word (*careful*). The distractors (e.g., *excited, advanced, difficult*) were (a) the same part of speech as the test word, and (b) drawn from the same frequency block or block just above or below the test word, but (c) distinctly wrong in our judgment and that of two graduate students.

Interview. Two forms of the interview were constructed so that each form tested, in random order, 28 words—4 words representing each of the 7 frequency blocks. Interview prompts for each word consisted of a card with the word typed on it, requests to define the word and use it in a sentence, and a probe question (e.g., "Where would you see a diagram?").

Procedure

The tests were given in the following order: yes/no, multiple-choice, and interview. The yes/no and multiple-choice tests were administered by classroom teachers or an assistant using a prepared script of instructions. Interviews were conducted 2 to 4 weeks later by a trained assistant.

Before the test began, students were told that it contained some "easy words, hard words, and groups of letters that look like words but really aren't." They were asked to put a check in the blank under the word "yes" if the item was a real word and they knew it; otherwise, they should check the blank under the word "no." Four practice items were provided. One of these emphasized spelling so the children knew they should not check "yes" unless "all the letters were right."

Two sample items preceded the multiple-choice test. For each actual test item, the examiner read the sentence aloud saying "blank" where the blank was. Students were given about 10 to 15 seconds to read the alternatives, after which the examiner repeated the sentence.

During the interview, the student was first asked to read the test word. If the test word was not read or mispronounced, the next word was presented. If the test word was read correctly, the interviewer asked for a definition and then asked the child to use the word in a sentence. If the definition or sentence did not clearly demonstrate knowledge of the word's meaning, the designated probe question was asked.

Interview responses were taped, transcribed, and reliably scored for both pronunciation (99% agreement) and meaning (96% agreement). A word was scored as known if the student (a) gave a reasonably close pronunciation and (b) displayed "some" knowledge of the word's meaning. Thus, our criterion for knowing a word's meaning was a lenient one that did not consider depth or precision of word knowledge.

Dependent Measures

There were three dependent measures: (a) the proportion of words known on the interview; (b) the proportion of words known on the yes/no test, considering only the 28 words that were on the particular form of the interview the student took; and (c) the proportion of words known on the multiple-choice test, considering only the 28 words that were on the particular form of the interview the student took.

The proportion known on the yes/no test was calculated using the Anderson and

Freebody (1983) formula, and the proportion known on the multiple-choice test was calculated using the standard correction for guessing (Downie & Heath, 1983):

$$R - [W/(n-1)]$$

where R = correct answers, W = wrong answers, and $n = 4$, the number of response alternatives. Corrected scores of less than zero were set equal to zero.

RESULTS

To study the validity of the tests across schools and grades, separate analyses of variance were performed on (a) the yes/no and interview data and (b) the multiple-choice and interview data. The design used in each case was a $3 \times 4 \times 2$ (School × Grade × Measures) factorial with repeated measures on the last factor. Our primary interest was in the interaction of measures with school and/or grade. To study the validity of the tests across reading skill groups, separate analyses of variance were performed on (a) the yes/no and interview data, and (b) the multiple-choice and interview data, using a 2×2 (Reading Skill × Measures) factorial design with repeated measures on the last factor. Correlational analyses were also performed as explained below.

Validity Across School Populations

Table 1 shows the mean proportions of words known on the three tests for each school and all subjects. Notice that the overall proportions for the yes/no and multiple-choice tests are close to each other (.61 versus .63) and close as well to the overall proportion for the interview (.59). Due to the sensitivity of the design, however, the difference between the yes/no and interview proportions was statistically significant, $F(1, 266) = 4.27$, $p < .05$. The multiple-choice proportion was also significantly higher than the interview proportion, $F(1, 271) = 38.14$, $p < .0001$.

The school by measures interaction was not significant in the analysis of yes/no and interview data, but it was significant in the analysis of multiple-choice and interview data, $F = 5.82$, $p < .004$. As Table 1 shows, there was a larger difference favoring multiple-choice over interview proportions at Schools A and B—the schools enrolling

Table 1

Mean Proportion of Words Known on the Tests by School

	Yes/No	Multiple-Choice	Interview
School			
A	.70	.75	.70
B	.60	.63	.56
C	.51	.50	.49
Overall	.61	.63	.59

suburban middle-class white students and urban disadvantaged black students, respectively—than at School C, the school enrolling disadvantaged Asian/Pacific students. The triple interaction of school, grade, and measures was not significant in any analysis.

The above findings indicate a slight degree of overestimation of word knowledge with both the multiple-choice and yes/no tests. The yes/no test was certainly not inferior to the multiple-choice test insofar as overestimation is concerned; in fact, the yes/no proportions were lower and closer to interview proportions. More importantly, the yes/no test gave consistent results across mainstream versus nonmainstream school populations.

Validity Across Age Groups

Table 2 shows the mean proportions of words known on each test by grade. The grade by measures interaction was not significant in either the analysis of yes/no and interview data or the analysis of multiple-choice and interview data. It is apparent that word knowledge was slightly overestimated by the multiple-choice test at all grade levels. Despite the nonsignificant interaction, the means in Table 1 suggest that, with the yes/no test, there is somewhat greater accuracy (less overestimation) for children in Grades 1 and 2 than for children in Grades 3 and 4. However, the degree of overestimation for older children is not greater with the yes/no test than with the multiple-choice test.

Pearson correlations between yes/no and interview proportions were as follows: .75, .78, .65, and .73 for Grades 1 through 4, respectively, and .87 for all grades combined. The correlations between multiple-choice and interview proportions were as follows: .81, .87, .75, and .78 for Grades 1 through 4, respectively, and .91 for the four grades combined. Two points can be made about these correlations. First, they indicate that, within grades, the multiple-choice test accounted for about 8–15% more variance in the interview proportions than the yes/no test. Second, both the yes/no and multiple-choice tests were more highly correlated with the interview in Grades 1 and 2 than in Grades 3 and 4. Scatterplots by grade indicated that the somewhat attenuated correlations at Grades 3 and 4 were due to a restricted range of scores.

In summary, the yes/no test was a very accurate indicator of the average proportion of test words known by first and second graders, and a slightly more accurate indicator than the multiple-choice test. The amount of overestimation by the yes/no test

Table 2

Mean Proportion of Words Known on the Tests by Grade

	Yes/No	Multiple-Choice	Interview
Grade			
1	.29	.33	.30
2	.53	.58	.52
3	.78	.78	.73
4	.82	.82	.79

was somewhat greater for older students than for younger students, though not significantly so, and not more than the overestimation shown by the multiple-choice test for older students.

Validity Across Reading Skill Groups

The 288 interviewees were divided into two reading skill groups. These were: (a) unskilled readers, the bottom quartile who decoded less than half of the 28 words on the interview; and (b) skilled readers, the top 22% who pronounced at least 93% of the interview test words (the cutpoint of 26 words decoded was the closest possible approximation to the top quartile, due to a large number of tied observations).

As before, the proportions for the three tests were fairly close. For unskilled readers, the mean proportions of words known were .21, .27, and .20 for the yes/no test, multiple-choice test, and interview, respectively. For skilled readers, the mean proportions of words known were .89, .90, and .87 for the yes/no test, multiple-choice test, and interview, respectively.

In the analysis of yes/no and interview data, neither the main effect for measures nor the group by measures interaction was significant. In contrast, the analysis of multiple-choice and interview data produced a significant effect for measures, $F(1, 132) = 26.27$, $p < .0001$. Thus, the yes/no test overestimated word knowledge for neither unskilled nor skilled readers, whereas the multiple-choice test overestimated word knowledge for both reading skill groups.

DISCUSSION

This study has shown that when group means are of interest, a yes/no vocabulary test can give a very close approximation to results obtained with an interview assessment of word knowledge. The degree of overestimation of word knowledge that can be expected with a yes/no test is quite tolerably small, provided that nonwords are included on the test and the proportion of words truly known is calculated using the Anderson and Freebody (1983) formula.

Our yes/no test was a slightly more accurate indicator of the average proportion of words known than a multiple-choice test for younger, primary grade students and unskilled readers. For older elementary students and skilled readers, the yes/no test did at least as well as the multiple-choice test when compared to the interview criterion. As an added bonus, the yes/no test gave consistent results for mainstream and nonmainstream school populations, whereas the multiple-choice test did not.

The surprising accuracy of the yes/no test in determining group means is partly attributable to the fact that it yields an estimate of each individual student's tendency to overestimate his or her word knowledge, the proportion of false alarms to nonwords. The standard correction for guessing for a multiple-choice test, on the other hand, is the same for each student. Some students who do not know the correct answer may still know enough to eliminate one or more distractors. Therefore, the likelihood of a "lucky guess" is greater than the denominator of the standard correction factor, $n - 1$ (see Choppin, 1988).

It should be noted that a yes/no test is unsuitable for use as a posttest of the effects of vocabulary instruction (Anderson & Freebody, 1983). Some students who have not learned the meanings of instructed words may say "yes" because the words are familiar and they think they should know them.

Also, yes/no tests, like most multiple-choice tests, are not adequate for the purpose of assessing the reading vocabularies of *individual* students. In this study, the yes/no test accounted for just 42–61% of the variance in the interview criterion within grades, and the multiple-choice test accounted for 56–76% of the within-grade variance. However, given a set of uninstructed words and some group(s) of students, yes/no testing offers a highly efficient and accurate way to estimate the average proportion of words that students can read and understand.

In conclusion, yes/no tests can be useful for assessing the reading vocabularies of quite diverse groups of students. Another interesting application we envision is selecting words for vocabulary instruction. Teachers or curriculum developers could easily be shown how to use the technique to identify words that are actually unknown by most students in a class or grade level at a particular school. Of course, the to-be-instructed words should also reflect central ideas in the material to be read, or else qualify as generally useful words (see Beck, McKeown, & Omanson, 1987).

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BEYOND VINSONHALER: A NATURALISTIC INVESTIGATION OF THE PROBLEM IDENTIFICATION STRATEGIES OF EXPERT READING DIAGNOSTICIANS

Susan G. Magliaro
Virginia Tech

Problem solving is a complex thinking process involving goal-directed activity across a sequence of stages. Polya (1957, 1968) outlines four stages: (a) understanding the problem, (b) devising a plan, (c) carrying out the plan, and (d) looking back. Of these, the first is the most critical for a successful solution (Newell & Simon, 1972). The solver must gather information about the problem, find out what is known and unknown, and assess conditions in which the solution must be generated. Consequently, success at this stage requires the solver to be knowledgeable of the content area and to identify relevant cues that will lead to accurate identification of the problem (Neves & Anderson, 1981).

Epitomizing problem identification is the process of diagnosis. Pioneering work in this area has been conducted by Elstein and colleagues (e.g., Elstein, Kagan, Shulman, Jason, & Loupe, 1972; Elstein, Shulman, & Sprafka, 1978; Shulman & Elstein, 1975) using medical diagnosticians. Their findings indicate experienced physicians leap directly to a small array of provisional hypotheses early in their meetings with patients. Further, these hypotheses are generated out of physicians' knowledge of medicine, including their range of experiences associated with problematic cues recognized in early stages of interaction with patients.

Extensions of such work into the area of reading diagnosis by Vinsonhaler and colleagues (e.g., Gil, Hoffmeyer, VanRoekel, Vinsonhaler, & Weinshank, 1979; Lee & Weinshank, 1978; Vinsonhaler, Weinshank, Wagner, & Polin, 1983) have indicated that, unlike medical diagnosticians, reading diagnosticians evidence little intra- or interdiagnostician consistency. Further, their prescriptions appear to be unrelated to their diagnoses. Examination of this research reveals that to maintain a controlled, experimental environment, Vinsonhaler and his colleagues restricted availability of "extraneous" cues. This goal moved the studies away from more "natural" settings which had succeeded in medicine toward more discrete events and measures representing "clients" by boxes of data. Individual cues (e.g., test scores) could be accessed only one-at-a-time, in a sequential manner. This method made it impossible to discern interactions between multiple cue judgments, pattern recognition, and knowledge structures. These studies ignored the powerful effect of context (i.e., availability of effective cues) on domain-specific, skilled memory. In addition, data analysis focused on the product of the interaction, the written diagnosis. Consequently, the generative, diagnostic process, which would include such activities as specific cue selection and hypothesis generation and testing, was not examined. With these limitations in mind, a re-examination of the process of diagnosis was designed to replicate the work of Vinsonhaler and his colleagues in more ecologically valid settings.

METHOD

Participants

Three reading specialists (Amy, Bonnie, and Pat), a learning disabilities specialist (Judy), and a classroom teacher (Sarah) were selected from a pool of 48 educators who were recommended by their public school supervisors and/or university professors. Criteria for recommendations included at least 5 years of successful teaching experience, a master's degree, and demonstrated, consistent expertise in diagnosing children's reading difficulties. Each person in the sample had a master's degree in reading or learning disabilities and a range of teaching experience from 7 to 36 years.

The clients (ages 8—11, three girls and three boys) with whom diagnosticians worked were enrolled in a university reading clinic. Each client had a history of reading problems and was recommended to the clinic by their parents.

Settings, Equipment, and Materials

All sessions were video- and audiotaped. Videotapes for experimental sessions were made during the first round of interactions with clients. For 5 clients, (who would be diagnosed via three formats), the taped interaction from the first experimental session was used for the videotaped session. For the 6th client, who represented our control condition, videotaped interaction consisted of this client with a diagnostician employed by the clinic. In all cases, these interactions represented the first time each client-diagnostician pair worked in a diagnostic session together.

Case information on each client was organized in a file box, categorized by major source of information (see Table 1) and was based on inventory categories used by Vinsonhaler et al. (1983).

Diagnosticians used their own testing materials or materials at the clinic when working with clients. Materials included standardized reading tests, language assessments, informal assessments, tradebooks, paper, pencils, and drawing markers. During the interaction, additional materials could be selected and used at any time.

Procedure

Data collection. Five experimental sessions were conducted with each of the 5 participants (see Table 2). Each consisted of a preparation stage (examining the client's file), an interaction stage (working with the client in either live, videotaped, or "boxed"/audiotaped format), a written diagnosis stage, and a "wrap-up" stage that elicited a diagnostic summary statement, prescription, and reflection on the session. Tasks varied by mode of interaction with client, amount of time allocated to each stage (based on expert judgment), and nature of verbalization (descriptive or explanatory) and the verbal report. Depending on the nature of specific experimental sessions, a "think-aloud" report (on-line process reporting) or stimulated recall (reflection on an activity, often using video- or audiotapes for retrieval cues [Ericsson & Simon, 1980, 1984]) was used. Two weeks after the last experimental session, all participants met for a final debriefing session. This session was audiotaped and transcribed, and the information used as clarification and corroboration of statements made during sessions.

Client rotation and session order. Five clients were rotated through experimental Sessions I–IV, allowing each to be diagnosed by 4 diagnosticians and four different session procedures. All diagnosticians worked with the 6th client in experimental Session V as a control condition. Experimental session order was counterbalanced within constraints of parents' schedules and inclement weather. Sessions were completed within 4 weeks.

Data Sources and Analyses

Major data sources were verbal reports from audio- and videotape records from sessions, diagnosticians' notes from preparation and interaction stages, and the written diagnoses. Data were analyzed on two levels (see Figure 1). On the first, a quantitative descriptive analysis of major variables noted by diagnosticians was conducted along with a qualitative assessment of the relational nature within these variables. On the second level, cue selection and hypothesis testing strategies were examined using a process tracing analysis.

RESULTS AND DISCUSSION

Results from the Level 1 Analysis

The first level of analysis created a description of the number and nature of major variables composing the diagnostic process. Three main sources of information provided diagnosticians with these components across all experimental sessions: file information (e.g., family background, grades, etc.), observation of client behavior (e.g., oral reading, physical activity, etc.), and task environment (e.g., tests, interactions, etc.). Although two variables, cues and hypotheses, were the initial focus of the study (cf., Vinsonhaler et al., 1983), analysis revealed different dimensions of these cues were critical to the diagnostic process. Five major variables emerged: single cues, multiple cues, missing cues, inferences, and hypotheses.

Single cues. Across all conditions and diagnosticians, mean number of single cues considered by each diagnostician for each experimental session was 249. These were organized into six major categories (see Table 3). For all categories except the last, single cues were gleaned from file reports or observations and/or questions asked during interactions. Percentages of file report cues was greatest in the audiotaped condition where access to clients was most limited (68% of single cues), and least in the live conditions where access was most open (53% of single cues).

All diagnosticians concurred that the most important information was working with actual clients in the teaching situation. From diagnosticians' perspective, the

Table 1

Case Information Inventory Master List of Cues Available to the Diagnosticians for Each Experimental Session (i.e., Availability Dependent upon Individual Client's File).

- I. General Information
  - I-A. Referral to the Reading Clinic (comments from the school)
  - I-B. Referral for school-related special services
  - I-C. General/family background
- II. Health/medical Information
  - II-A. History of childhood diseases
  - II-B. Immunization history
  - II-C. Height/weight records
  - II-D. Vision
  - II-E. Hearing
  - II-F. Teeth
  - II-G. Throat
  - II-H. Speech
- III. School Information
  - III-A. Attendance
  - III-B. Academic progress (report cards)
- IV. Tests/assessments administered by the school
  - IV-A. Kindergarten screening
  - IV-A. Kindergarten skills checklist (for one client only)
  - IV-B. Metropolitan Readiness Test
  - IV-C. Curriculum Referenced Tests of Mastery
  - IV-D. SRA Skills Assessment
- IV. Tests/assessments administered by the school (*continued*)
  - IV-E. Open Court Headway/Virginia Standards of Learning
  - IV-F. Woodcock-Johnson Psychoeducational Battery of Tests
  - IV-G. Weschler Intelligence Scale for Children - Revised
  - IV-H. Bender Gestalt/Motor Test
  - IV-I. Slingerland Screening for Specific Learning Disabilities
  - IV-J. Test of Written Language
  - IV-K. The Visual Aural Digit Span Test
  - IV-L. Kaufman Assessment Battery for Children
  - IV-M. Adaptive Behavior Evaluation Scale
  - IV-N. Peabody Picture Vocabulary Test
- V. Tests/information reported by the Reading Clinic
  - V-A. Tutor's report
  - V-B. Informal reading inventory
  - V-C. Peabody Picture Vocabulary Test
  - V-D. Bryant Diagnostic Test of Phonics Skills
  - V-E. Woodcock Reading Mastery Tests
- VI. Tests/information reported by independent reading diagnostician
  - VI-A. Peabody Picture Vocabulary Test
  - VI-B. Spache Informal Reading Inventory
  - VI-C. Bryant Test of Phonics Skills
  - VI-D. Informal written language assessment

Table 2

Description of the Five Experimental Sessions

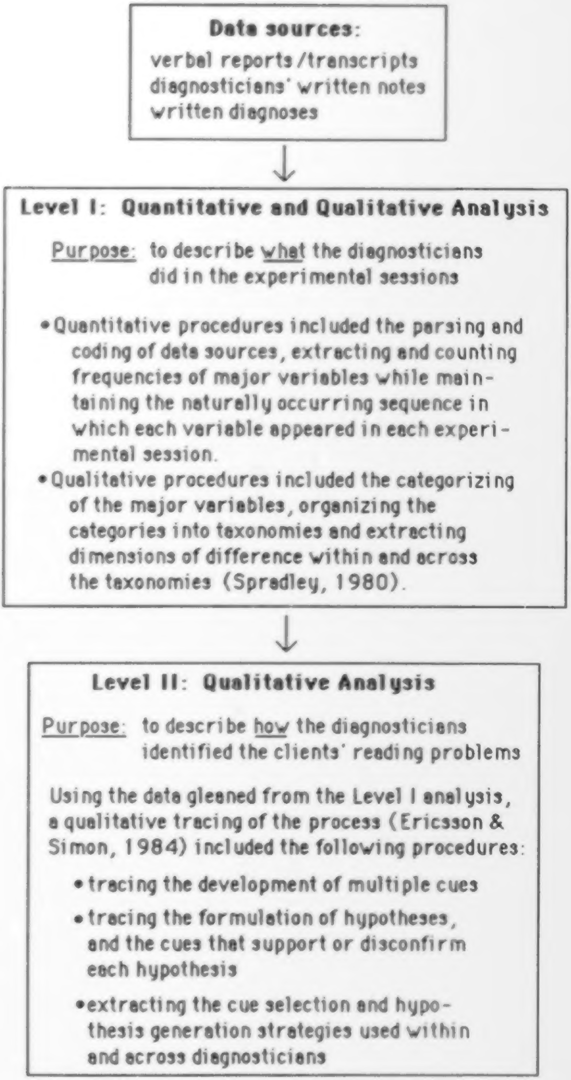
Session	Nature of Client and Diagnostic Interaction	Order of Treatment Stages*
I	Live client: each diagnostician works with a different client.	Preparation, interaction, written diagnosis, stimulated recall, wrap-up
II	"Boxed" client: replication of Vinsonhaler et al. studies; each diagnostician reviews the file and audiotapes of a different client.	Preparation, interaction with audiotaped reading, written diagnosis, stimulated recall, wrap-up
III	Live client: each diagnostician works with a different client (also different client than diagnosed in session I).	Preparation, interaction, stimulated recall, written diagnosis, wrap-up
IV	Videotaped client: using videotapes generated in session I, each diagnostician identifies the reading difficulty(ies) of clients who have worked with other diagnosticians in this study.	Preparation, interaction (both of these stages involve "think-aloud" verbal reports), written diagnosis, wrap-up
V	Videotaped client (control condition): all diagnosticians identify the reading difficulties of a child who is working with a diagnostician not in this study.	Preparation, interaction with videotaped client, written diagnosis, stimulated recall, wrap-up

*Descriptive think-alouds were used in all preparation and interaction stages, except where noted in experimental session IV.

interaction served two purposes: (a) to test hypotheses or questions formulated from file information, and (b) to allow diagnosticians to implement their own assessments that would render data particularly meaningful to them.

Multiple cues. Across all conditions and diagnosticians, mean number of multiple cues detected per session was 92. Similar to findings of Bruner, Goodnow, and Austin (1956), the basic dimension of difference in multiple cues emerged as the distinction between conjunctive and disjoint multiple cues. A conjunctive cue is one in which two or more single cues or multiple cues are joined positively (e.g., an SRA total reading score and an informal reading inventory grade equivalent). An example of a disjoint cue is the client having an "A" for reading, yet his or her SRA score is 2 years below level. Number of different conjunctive cues was far greater than number of disjoint cues cited by each diagnostician in each session. As the diagnostic process was traced, multiple cues built on each other and "grew" in size and complexity to form related chunks of information.

Missing cues. Across all sessions, mean number of missing cues requested by diagnosticians was 47. As missing cues were defined as pieces of unavailable information requested by diagnosticians, these "pieces" ranged in "size." A requested piece of information might be a single cue (e.g., a test score) or a multiple cue (e.g., a



Data sources:
verbal reports/transcripts
diagnosticians' written notes
written diagnoses

Level I: Quantitative and Qualitative Analysis

Purpose: to describe what the diagnosticians did in the experimental sessions

- Quantitative procedures included the parsing and coding of data sources, extracting and counting frequencies of major variables while maintaining the naturally occurring sequence in which each variable appeared in each experimental session.
- Qualitative procedures included the categorizing of the major variables, organizing the categories into taxonomies and extracting dimensions of difference within and across the taxonomies (Spradley, 1980).

Level II: Qualitative Analysis

Purpose: to describe how the diagnosticians identified the clients' reading problems

Using the data gleaned from the Level I analysis, a qualitative tracing of the process (Ericsson & Simon, 1984) included the following procedures:

- tracing the development of multiple cues
- tracing the formulation of hypotheses, and the cues that support or disconfirm each hypothesis
- extracting the cue selection and hypothesis generation strategies used within and across diagnosticians

Figure 1. A descriptive schematic of the data analysis procedures.

writing sample). The nature of these cues paralleled the single cue categories as outlined in Table 3. Three interrelated factors influenced number of missing cues: nature of the interaction, consistency between information in the client's file, and the client.

Inferences. Inferences were defined as information based on the diagnostician's prior knowledge, instantiated and applied to a diagnosis. For example, noticing a

Table 3

Taxonomy of Single Cues Identified across All Experimental Sessions Across All Diagnosticians

	General/Family Background
From the records:	*From interaction:*
Age	Interests
Grade	Favorite toys, games, books
Birthdate	Bedtime
Birthplace	Television watching habits
Father's education	Time spent on homework or pleasure reading, or play
Mother's education	Parents' speech patterns
No. of brothers, ages	Living arrangements and visitation habits with divorced parents
No. of sisters, ages	
Family status	Responsibilities at home
Misc. information (e.g., rides the bus)	
	Health/Medical Information
From the records:	*From interaction:*
Childhood diseases	Physical characteristics
Immunization	Cleanliness
Height/Weight	Neatness
Vision	Clothing
Hearing	Physical well-being
Teeth	Consistency of wearing prescribed glasses
Throat	
Speech	
	School Information
From the records:	*From interaction/general knowledge:*
Academic progress	Information about the school division
-grading system	Community socio-economic status
-grades	Comparison of client to classmates
-effort	Expectations of students in school division or by the teacher
-textbook series	
-book/grade level	Availability of programs and special assistance
-teacher comments	General attitude toward school, school subjects, teachers
academic	
behavioral	Size of reading group
suggestions for improvement	
encouragement/warnings	
-retention history	

Table 3 (*Continued*)

Attendance	
Special services	
-referrals	
-dates of referrals	
-teacher comments	
academic	
behavioral	
tentative hypotheses	
-present placements	
-parent involvement	
-history (years in programs)	
General Intellectual Ability	
From records/stand. tests:	*From interactions*
Name of test	Ease, clarity, and depth of conversation
Nature of test	Reactions to questions
Grade equivalent	Reaction time to answer questions
Percentile	Number of prompts used
Raw scores	Kinds of prompts used
Errors	No. of times questions had to be restated
Subtest scores	Speech patterns
Examiner's interpretations	Vocabulary
Examiner's notes about client's behavior during test	Use of details and explanations
	Depth of prior knowledge
Examiner's diagnosis	Humor
Examiner's recommendations	Ability to follow a complex set of directions
Level of Achievement	
From standardized tests on record:	*From tutor's report:*
Criterion referenced tests	No. of books read, examples
-gradient equivalent	Sight word performance
-standard scores	No. of stories written
-percentiles	Attitude
-skills mastered/not mastered	General comments
-raw score	Recommendations
Norm-referenced tests	
-grade equivalent	
-standard score	
-percentiles	
-subtest scores	
-miscues	

Table 3 (*Continued*)

From informal inventories (on record or administered during session):

- Word recognition list
  - -miscues related to phonetic and structural analysis
  - -reading level
  - -order words are read
  - -raw score
  - -percent correct
- Comprehension passages
  - -reading level
  - -miscues
  - -use of context
  - -corrections
  - -if errors made sense
  - -responses to comp. questions
    - type missed
    - depth of answer
    - completeness
    - speech patterns
    - speed of response
- Oral reading behavior
  - -effort
    - desire to continue task
    - attempt to attack words
    - attempt to answer questions
  - -fluency
    - ran out of breath
    - swallows
    - phrasing, word-by-word reading
    - hesitations, stops
    - pauses
  - -expression
    - voice
    - intonations
    - attention to punctuation
  - -humming during silent reading
  - -sighs
  - -escape behavior when asked to respond
  - -use of finger, etc, as placeholder

Other Cues from the Testing Situation

Contextual cues:

- Lighting
- Table/chair height
- Time of day
- Time to gather information
- Availability of information
- Time to test
- Nature of tests (e.g., nonsense vs. real words)
- Testing materials (e.g., scoring)
- Examiner (in audio/video sessions)
  - -background
  - -present assignment
  - -interaction w/client

Body language/nonverbal cures:

- Attention to the situation
- (e.g., looking around the room)
- Listening
- Proximity to testing materials and/or diagnostician
- Head movement during reading
- Order pictures are examined
- Use of fingers for reading
- Looking at diagnostician, pausing for help
- Restlessness
- Visible signs of stress (e.g., facial contortions
- Yawning, stretching
- "Fiddling" with glasses

client's grade and book level, a diagnostician inferred that the teacher did not group her students for reading. Across all sessions, a mean of 22 inferences were posited by the diagnosticians. Number of inferences was related primarily to experience with the diagnosed case. The most inferences appeared in the control condition with a learning disabled boy, (mean = 28; range = 22–33.) All diagnosticians had experience with learning disabled students and were aware of classic characteristics and typical remediation program for this problem.

In three sessions, one subset of inferenced cues was instantiated frequently, yet conservatively, across two clients who were twins. In all cases, diagnosticians surmised they were working with twins. They saw this as an opportunity to free themselves from spending time examining previously seen cues (that were inferred to apply to the sibling) in order to examine others that might be helpful.

Hypotheses. Mean number of hypotheses considered across all experimental sessions was 12 (range = 6–23). Differences appear to be related to individual diagnostician differences in cue selection strategies. A taxonomy of hypotheses generated by diagnosticians is in Table 4. Statements within these categories ranged in size and complexity, and could be composed of either conjunctive and/or disjoint statements. Across experimental sessions, the time to the first hypothesis varied from 17 seconds to 19 minutes.

Results from the Level II Analysis

Cue selection and utilization strategies. New cues were detected, interpreted, and used across the diagnostic process. A cue could represent a positive, negative, or neutral indicator of reading difficulty. Positive and negative cues were compared, interrelated, or stored depending on category of information being searched. Neutral cues were subsequently ignored. Inconsistent cues (that did not correspond with a confirmed set of multiple cues) were also ignored. Multiple cues contained positive and/or negative valences, resulting in conjunctive or disjoint units of information.

Teaching position and experiential background were factors that pervaded cue selection. As evidenced by their overt cue selection behavior, diagnosticians could be arrayed along a continuum that was anchored and labeled at one end as "test driven," and at the other as "activity driven" (see Figure 2).

Accuracy in cue selection and intepretation was influenced primarily by time available. "Errors" were noted when cues were selected or interpretations made that did not coincide with information outlined by the child's school reading specialist and the clinic's head diagnostician as being relevant to each case. In general, errors mirrored those of physicians. The most common error was over-interpretation; that is, diagnosticians gave too much credence to single or multiple cues. This often occurred in audio- and videotaped sessions when verification with the client was not possible. Other errors were underinterpretation, misinterpretation, and "uninterpretation" (i.e., cue not selected). These errors also occurred more frequently in the simulated versus live sessions but, in addition, were attributable to diagnostician's experiential background.

The most interesting point of consistency across diagnosticians was related to availability of cues. That is, in 16 of the 25 sessions the diagnosticians wanted more time to interact with clients over a series of sessions and conduct their typical diagnostic activities to arrive at what they perceived to be a more accurate diagnosis. In addition, diagnosticians wanted to consult with teachers, specialists, and clients' parents to gain a more complete picture of clients as readers.

Hypothesis-generation strategies. Diagnosticians generated hypotheses in much the same manner as physicians. General and specific hypotheses were generated simultaneously. New hypotheses appearing later in sessions seemed to be elaborations or refinements of earlier hypotheses.

Table 4

Taxonomy of Hypotheses Generated across All Experimental Sessions across All Diagnosticians

General/Family Background

- Number of siblings, birth order
- Twin effects
- Parental expectations, overprotective nature, willingness to accept child's problems
- Stability of family (two vs. single parent home, divorces/remarried parents)
- Quality/amount of intellectual stimulation in home environment

Health/Medical/Organic Problems

- Lasting impact of childhood diseases (e.g., high fever) or injuries (e.g., concussion)
- Allergies
- Hearing, vision and/or speech deficits
- Attentional disorder
- Large/small muscle coordination
- Immaturity, delayed development
- Neurological disorders (e.g., brain damage, seizures)
- Attendance/illnesses
- Perceptual disorders
- History of medications, if on medication presently for allergies or hyperactivity

School Context

- Compatibility with the teacher
- Compatibility with peers
- Compatibility with the reading series
- Expectations of the teacher, peers, school, community
- School's sensitivity to child's special needs
- Change of school context (e.g., due to moving, change in classroom structure)
- Ability to work in a large group
- Motivation to learn in school, working up to potential, general effort

Intellectual Ability/Ability to Learn

- Ability level/potential
- General knowledge/experiences
- Learning disability
- Memory deficit/disorder (i.e., recall, recognition, reconstruction)
- Metacognitive abilities
- Learning modality
- Language disorder (i.e., expressive or receptive)
- Ability to be taught

Level of Achievement

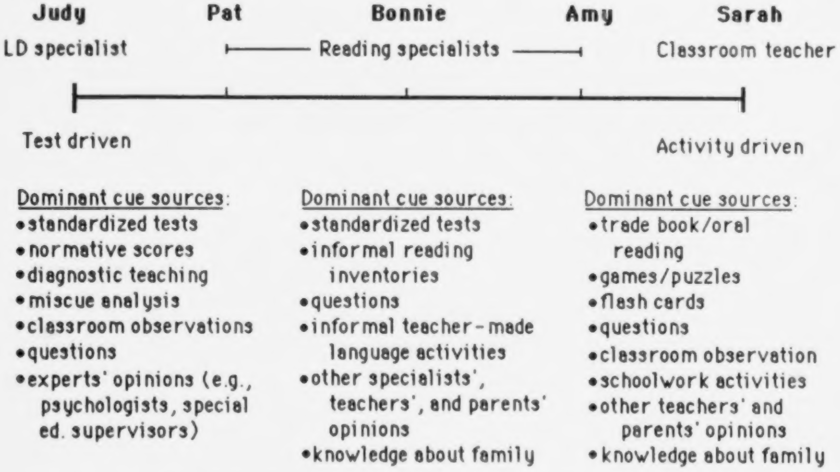
- Reading skills:
  - Phonics
  - Comprehension
- Oral reading habits (e.g., fluency, "page turner," word-by-word reader)
- Sight vocabulary
- Use of strategies (e.g., context)
- Relation of reading to skill in other content areas (e.g., math, social studies)
- Skill in mathematics
- Written language skills (form and content)

Tests/Testing Situations

- Cooperation during testing: willingness to respond to questions
- Appropriateness of tests or manner in which they were administered
- Client's understanding of test instructions or requirements

General

- Self-concept; self-image
- Ability and strategies used to handle frustration
- Willingness to please adults
- Influence of reading clinic on client's present reading ability and attitude



Dominant cue sources:
- standardized tests
- normative scores
- diagnostic teaching
- miscue analysis
- classroom observations
- questions
- experts' opinions (e.g., psychologists, special ed. supervisors)

Dominant cue sources:
- standardized tests
- informal reading inventories
- questions
- informal teacher-made language activities
- other specialists', teachers', and parents' opinions
- knowledge about family

Dominant cue sources:
- trade book/oral reading
- games/puzzles
- flash cards
- questions
- classroom observation
- schoolwork activities
- other teachers' and parents' opinions
- knowledge about family

Figure 2. A conceptual representation of the 5 diagnosticians' dominant cue source preferences.

Again paralleling problem identification processes found in medical diagnosis, the basic hypothesis-generation strategy followed one of two rules, with the first being the preferred case. First, select and support the hypothesis with maximum number of positive cues. If this strategy is not possible, the second rule is to select and support the hypothesis with maximum difference between positive and negative cues. In general, the more positive, available, relevant cues, the more likely the client's problem was diagnosed by all diagnosticians.

A related strategy used by all diagnosticians (and parallel to physicians) was the "quick rule-out." This strategy enabled diagnosticians to eliminate quickly any single or multiple cue, leaving capacity in short-term memory to consider other, more speculative hypotheses. Mean number of quick rule-outs across sessions was 1.6 (range = 1–5). Across all sessions, all diagnosticians sought first to eliminate health as a factor contributing to the reading problem.

SUMMARY AND CONCLUSIONS

The Diagnostic Process

Findings portray the expert reading diagnostician as an active, and somewhat predictable, problem solver. This individual engages in a problem identification sequence similar to the one outlined by Polya (1968). Cues are selected from the environment based on one's prior knowledge and experience in diagnosis. Selection strategies are influenced by availability of cues in the task environment (Norman, 1969). Dominant cues (with dominance related to prior experience) are sought first (Underwood & Richardson, 1956). Based on rules guiding cue salience (Trabasso, 1963), less preferred cues are selected and used only if time permits or dominant cues are not available.

"Knowns" and "unknowns" are assessed. Inferences about missing cues are instantiated and used to reduce the "unknowns" (Anderson & Pearson, 1984). More data are selected, evaluated, and, depending on the evaluation, either chunked with developing knowledge about the problem, or ignored. Prior knowledge related to selected, salient data is accessed and assimilated where appropriate (Neves & Anderson, 1981). Thus, original single or multiple cues or pieces of information develop into beginnings of a representation of the problem. During the process, questions are raised and hypothetical statements about the reading problem are entertained.

Typical Diagnostic Assessment

In the original examination of reading diagnosis (Vinsonhaler et al., 1983), available cues were for the most part derived from standardized assessments. In this study, that information was only part of the data (and for some, a very small part) needed to identify clients' reading problems. Standardized tests results comprised only about 14% of information diagnosticians gleaned from files and client interaction. Self-reported typical assessments used in this study substantiate the minor role that standardized tests play in formulating diagnoses. Alternative assessments were noted in live and simulated sessions. Examples include trade books, informal written language samples, games and activities with multiple directions and rules, and client observation in regard to other environmental stimuli and nonreading related task requirements. These observations support Johnston's (1984) notion that alternative means of assessment are taking place in real diagnostic settings, and that this informal, unstructured assessment deserves study. Relevant to this study is the subsequent support to the original proposal that typical, and perhaps dominant, cues on which diagnosticians base decisions were not available in Vinsonhaler et al.'s (1983) study.

The Nature of Reading Diagnosis

Reading diagnosis is a complex and interactive cognitive process, requiring a quantitative and qualitative level of expertise. This expertise involves knowledge of reading, human development and learning, assessment, contextual constraints and possibilities, and strategies enabling knowledge to come together to identify a client's reading problem. In addition, the task is not linear; it requires diagnosticians to constantly return to the task environment for new and/or supportive information. Because problems are identified based on prior knowledge and experiences, training and experience are essential to accurately identify important and ignore irrelevant cues.

Reading diagnosis is an interactive process in that the product (i.e., the diagnosis) is based on the nature of the interaction between diagnostician, client, and assessments. It is more than selection of cues such as test scores. This interaction can be seen in this study's data in terms of what diagnosticians observed and subsequent hypotheses that were generated.

Perhaps, the most important implication is that reading diagnosticians may not be internally inconsistent, as the Vinsonhaler research seemed to indicate. It appears likely that earlier studies may have actually created intradiagnostician differences as artifacts of the artificial client simulations. This study's findings indicate expert diagnosticians rely on many cues and their complex permutations and interactions. When information is not available, they infer based on evidence or withhold the diagnosis. Given the restricted setting of the Vinsonhaler studies and the emphasis on production of a written diagnosis, participants may have had to make a number of inferences, resulting in the inconsistent diagnoses and prescriptions.

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THE QUALITATIVE READING INVENTORY: ISSUES IN THE DEVELOPMENT OF A READING DIAGNOSTIC TEST

Lauren Leslie
Marquette University

JoAnne Caldwell
Cardinal Stritch College

Recent research on comprehension has found that characteristics of text and of the reading task, as well as characteristics of the reader, influence comprehension of text material (e.g., see Brown, Bransford, Ferrara, & Campione, 1983). One characteristic of text found to influence recall and/or comprehension is the *structure of the text*. In narrative text, stories using the structure of fables have been shown to be easier for children to recall than narratives without the major story components (Stein, 1979) or with the structure disrupted (Mandler & DeForest, 1979). Brennen, Bridge, and Winograd (1986) found that children were better able to recall a story when it conformed to the structure of a goal-based narrative than in its original, nongoal-based form. In expository text, passages written according to the causation top-level structure are easier to recall than those written through a description top-level structure (Meyer & Freedle, 1984). In addition to the variation within narrative and expository text, there are obvious differences between the two structures. Whereas narratives involve major characters engaged in some type of action, expository material typically presents information through description, comparison-contrast, or cause-effect. This information is usually structured as main ideas (stated or implied) and supporting details or explanation. It is the view of the authors that these features of text structure should be systematically examined when evaluating a child's reading abilities.

To examine the effect of text structure on reading comprehension we must have measures sensitive to the structural differences. *Recall* has been the major measure used because it provides the examiner an index of how information is stored in memory without the prompting effect of questions. A student's recall can be analyzed for how it matches the structure of the text (Meyer & Freedle, 1984). For example, if the expository passage was written in a problem-solution format, one can examine whether the reader used this structure to organize recall. In addition, one can also examine recall of a narrative to ascertain whether features of a story were recalled. These methods of analysis allow the examiner to assess the quality of recall. Also, quantity of recall can be examined through propositional analysis (Clark & Clark, 1977). In contrast, *comprehension questions* examine how a student understood a selection without memory demands of the recall task. Although answers to questions are influenced by information provided by the questions, answers are the major means of teachers' assessment of comprehension in the classroom (Durkin, 1978–79). The use of quantity and quality measures of recall, in addition to comprehension questions, allows the examiner to assess comprehension under different task conditions. Thus, instructional recommendations can be made based on what the student can do under different conditions.

Another body of research that has major implications for evaluation of reading abilities is the influence of *background knowledge* on comprehension of text. Results clearly indicate that the more accurate knowledge one has in a content domain, the greater the memory and comprehension of text. These findings apply to narratives (Steffenson, Joag-Dev, & Anderson, 1979) and to exposition (Recht & Leslie, 1988; Taft & Leslie, 1985). Prior knowledge must be assessed when evaluating a child's reading ability. Failure to do so can result in an inaccurate estimate of the child's instructional reading level, and/or in an unenlightened explanation of why the child is having trouble comprehending text.

The remainder of this paper describes our attempts to examine *reading comprehension* under these conditions using a test we developed, the *Qualitative Reading Inventory* (QRI). The test is called qualitative because for many students their scores will depend on the type of text, background knowledge, and manner in which comprehension is assessed. Thus, although the scores are quantitative, their interpretations must be qualified, for example, by the types of material read. We will not present validity evidence on the use of the QRI to identify reading levels, or to diagnose word recognition abilities, although such evidence is available (Leslie & Caldwell, in press).

PILOTING OF THE QRI

General Test Characteristics

The Qualitative Reading Inventory (QRI) is an informal reading inventory designed to facilitate examination of readers' comprehension abilities in narrative and expository text. Both types of passages are provided for students reading from primer through junior high material. At primer, first, and second grade levels goal-based and nongoal-based narratives are included because at these levels children's school reading materials are comprised of both types of narratives. On the QRI, all narratives above second grade are goal-based because we found fewer nongoal-based narratives in children's reading materials at these levels.

The QRI measures comprehension through retelling and questioning. The quality of retelling is assessed by a comparison of the retelling to a passage map which contains important elements in the text. The maps were constructed by a theoretical and empirical process. First, all passages were propositionally analyzed (Clark & Clark, 1977). Then retelling was quantitatively scored by comparing propositions recalled to those in the passage. Propositions most frequently recalled by our pilot sample and those structurally important to the narrative or expository passage were placed on a passage map. The QRI will be published with passage maps. The explicit and implicit comprehension questions also assess understanding of important elements in the text.

The QRI measures background knowledge of important concepts on each passage prior to reading. The free association technique (Langer, 1984) asks the student to respond to concepts which were identified as important to comprehension of the passage. Responses are scored according to their level of abstractness. In addition, the QRI contains passages which pilot data indicate vary in familiarity. Thus, the examiner is able to assess comprehension in relatively familiar versus unfamiliar material.

In summary, the QRI is an informal reading inventory designed to facilitate the diagnosis of reading abilities considering: (a) structural characteristics of the text, (b) the way comprehension is measured (quantity and quality of retelling vs. questions), and (c) the background content knowledge of the reader.

Sample

The original QRI had 66 passages and was piloted on 425 Wisconsin children and adults. There were 60% males and 40% females in the sample and we were able to obtain standardized reading test data on 63% of these. Of this 63%, 60% scored at or below the 50th percentile. Thus, our sample is more heavily weighted with students of below average reading ability. About 177 of these children came from two reading clinics. The Marquette University Education Clinic primarily serves lower class, inner-city children, a large percentage of whom are minorities. The Cardinal Stritch Clinic serves a middle or upper middle-class population, many of whom are showing reading difficulties for the first time in content areas. In addition to the clinic children, 170 elementary school children, 58 average and below average middle and high school students (from four schools), and 20 adult poor readers (from the adult basic education and adult high school classes at the Milwaukee Area Technical College) were tested by their reading teachers or graduate students in reading. Data presented here are analyzed on all or a subset of the 425 subjects.

RESULTS

Interscorer Reliability

Estimates of interscorer reliability of free association and explicit and implicit comprehension were assessed by examining data from 122 readings. Data were gathered across all readability levels and all types of passages. Alpha reliability estimates (Cronbach, 1951) were .99 for free association, .98 for explicit questions, and .98 for implicit questions.

A sample of 393 passages was used to estimate the reliability of scoring the list of propositions from which we built our passage maps. Again, all levels and types of passages were represented. The alpha estimate of interjudge reliability was .94.

Comprehension in Narrative Versus Expository Text

One of the theoretical foundations of the QRI is that comprehension differences should be found among goal-based narratives, nongoal-based narratives, and expository material. Multivariate analyses of variance analyzing differences across passage types were conducted on comprehension scores, total propositions recalled, and propositions retold (from the passage maps). Separate analyses were conducted on passages at each readability level. Student data were used in the analyses if the student had read at least one passage of each type within a readability level. Thus, passage type was a within-subjects variable.

Results differed according to readability level of the passages. Significant multivariate effects of passage type were found at all levels except fifth. At primer, goal-based narratives were comprehended better than both nongoal-based narratives and expository passages, which did not differ from each other, $F(1, 16) = 4.56$, $p < .05$. At first and second grade, goal-based and nongoal-based narratives did not differ from each other but were comprehended better than expository passages, $F(1, 18) = 15.16$ and $F(1, 10) = 14.34$, $p < .01$, respectively. Also at first grade, goal-based narratives were more completely retold than nongoal-based narratives, $F(1, 18) = 14.21$, $p < .001$, and both types of narratives were retold more completely than expository, $F(1, 18) = 31.31$, $p < .001$. Quality of recall was better on first grade goal-based than nongoal-based narratives, $F(1, 18) = 17.88$, and quality of recall on the narratives surpassed the expository $F(1, 18) = 48.33$, $p < .001$.

From third through eighth grade all narrative passages were goal-based. At third grade, quantity, $F(1, 36) = 8.93$, $p < .01$, and quality, $F(1, 36) = 5.71$, $p < .05$, of retelling of narratives was significantly greater than for expository passages, despite nonsignificant differences on comprehension questions. At fourth grade, narratives were comprehended better, $F(1, 30) = 6.27$, $p < .05$ and the quality of their recall was better, $F(1, 30) = 21.86$, $p < .001$, than on exposition. At sixth and seventh grades, only quality of retelling differed, with narrative exceeding expository, $F(1, 37) = 9.21$, $p < .01$ and $F(1, 38) = 14.75$, $p < .001$, for sixth and seventh grades respectively. All significant differences remained when free association scores on the passages were used as covariates. Thus, differences are more likely due to structural differences than to differences in background knowledge. On many expository passages background knowledge scores were higher than on narratives at the same level. Although differences at Grade 5 were nonsignificant, the mean quality of retelling score was 3% higher on narrative text.

Eighth-grade passages showed a reversed pattern, however; the comprehension of exposition was higher than for narratives, $F(1, 27) = 11.93$, $p < .01$. No differences were found on retelling measures. The differences between exposition and narrative were not significant when free association scores were used as a covariate. Thus, exposition was comprehended better because readers had greater content knowledge about the expository subjects (fireworks, diamonds, hot springs, and the city of Constantine) than about the narrative biographies (Lewis and Clark, Magellan, Caesar, and Peter the Great).

There is evidence that our pilot sample showed differences in comprehension and/or retelling as a function of different types of text. All differences favored narrative text until eighth grade and the quality of retelling was more sensitive to text differences than the quantity of recall. The finding that text type often affects comprehension suggests that any test of reading comprehension should consider type of text as an important variable.

Comprehension as a Function of the Reading Task

The relationship between retelling and comprehension as measured by questions. Correlations between total retelling scores and total question scores were examined on all 66 passages. The number of significant correlations ranged across readability levels of the passages. At primer, first, and second grade levels correlations were significant on only two of six passages per level (values ranged from .33 to .69). At the third through fifth grade levels, five to six of the eight passages per level showed significant correlations between retelling and comprehension on questions (values ranged from .30 to.72). A drop occurred on sixth and seventh grade passages where only two of eight passages per level showed significant correlations (values ranged from .38 to .52). At the eighth grade level, six of the eight passages showed significant correlations (values ranged from .43 to .68).

We believe it is safe to conclude that retelling and comprehension share some of the same processes, but that there are differences in the processes required on these tasks. For beginning readers, the relationship between retelling and comprehension, as measured by questions, is not strong. Many children have not been asked to retell what they have read, yet they are familiar with the question format. Their lack of structural knowledge may also prevent more complete retrieval of information from memory. For older students the relationship between the comprehension measures is generally significant and of moderate value (average $r = .50$). In addition, results of the narrative and expository analyses indicate differences between these text types may be found on one measure (e.g., quality of retelling) but not on another (e.g., questions).

The relationship between explicit and implicit comprehension. Because of the small number of questions on each passage, we examined the correlation between explicit and implicit comprehension on data from 33 sets of two passage pairs. In our original 66 passages, there were two to four passages of the same type (e.g., goal-based narrative, nongoal-based narrative, and expository) at each level. We collapsed data from subjects who had read these passage pairs and examined the correlation between explicit and implicit comprehension. The correlations ranged from .01 to .72. Only 21% of the passage pairs showed correlations greater than or equal to .60. The primer and first level passages showed consistently higher correlations than the higher passages (5 of 6 correlations were >.50). Correlations between explicit and implicit comprehension were also higher on goal-based narratives than on expository passages.

Comprehension Differences as a Function of Reader Factors

Prior knowledge and prediction of comprehension. To test whether the concepts measured prior knowledge important to the understanding of the passage, correlations between free association scores and comprehension scores were calculated. The score on each concept, as well as the total free association score, was correlated with comprehension, as measured by retelling and by questions. The results on the original 66 passages were examined. When a concept did not correlate with comprehension, yet other concepts on the same passage were correlated with comprehension, the concept was removed from the total free association score and the changed total free association score was correlated with comprehension.

The results showed that on 50% of the 66 original passages the total free association score (or the changed total free association score) was significantly ($p<.05$) related to comprehension as measured by questions, retelling, or both. An additional nine passages showed correlations on which the probability of significance was <.10. The significant correlations ranged in value from .30 to .61, with Ns ranging from 20–40.

Knowledge versus general reading ability in prediction of comprehension. To determine if free association or standardized achievement test scores were better at predicting comprehension, we conducted regression analyses on all passages which showed significant correlations between free association and comprehension. Using the stepwise method, percentile rank and total free association were entered to predict total comprehension as measured by questions. Results of the 33 analyses showed that seven times neither variable predicted, probably because of reduced variance in comprehension. Five times percentile entered alone, accounting for 24–33% of the variance in comprehension scores. In all other cases free association contributed significant variance. Fourteen times free association was the only variable to predict comprehension, accounting for 12–56% of the variance in comprehension scores. Twice free association entered first, and percentile added 3% or 5% independent variance. Five times percentile entered first, and free association added 6–10% independent variance.

In conclusion, prior knowledge was more frequently predictive of comprehension on a specific passage than a general reading achievement measure, illustrating the value of measuring prior knowledge in an evaluation of reading comprehension.

CONCLUSIONS

The pilot data described here support the model proposed by Brown et al. (1983) that learners/readers are affected by the type of material presented, the demands of the task, and their knowledge base. It is our contention that reading tests must begin to examine reading while considering the knowledge base of the student, the types of materials presented, and how reading is measured. Ignoring such influences presents reading comprehension as a unitary dimension, which our data suggest it is not.

To assess whether we have been successful at providing an examiner with useful diagnostic information, we should conduct instructional studies. In addition to determining the reliability of our diagnostic judgments (87% agreement on all categories) we must establish that these diagnoses were an accurate representation of the child's reading abilities or disabilities. Instructional studies should be conducted to determine if instruction in the area of weakness results in improved scores on the type of material deemed a problem. For example, if a diagnosis indicated that a child's problem was in expository material, and so that child was instructed on the structures and purpose of expository material, then his or her performance should increase more in expository material than in narrative material. Students not instructed should not show such progress. The studies should be conducted to verify the diagnostic decisions based on the results of the QRI.

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WHAT DOES MAXIMUM ORAL READING RATE MEASURE?

Ronald P. Carver
University of Missouri—Kansas City

This research investigated whether maximum oral reading rate is a valid indicator of rauding rate for elementary and secondary students. Rauding rate (R_r) is a construct in rauding theory (Carver, 1977) that refines the concept of reading rate. R_r is defined as the fastest rate at which an individual can accurately comprehend relatively easy material (Carver, 1981). Rauding rate is theorized to be limited by how fast individuals can internally articulate each word and still be able to comprehend the complete thought in each sentence of a passage. Since rauding rate involves internal articulation, it seems possible that a measure of how fast individuals can externally articulate each word might provide an indicator of rauding rate, R_r. The fastest rate at which individuals can pronounce each word in a relatively easy passage will be called *maximum oral reading rate* (MORR).

It has also been hypothesized that individuals typically read silently at their rauding rate, at least when reading materials that are not too difficult for them (Carver, 1983). Empirical support for this hypothesis comes from research finding a close relationship between silent reading rate and scores on an objective test purporting to reflect rauding rate (Carver, 1986). Silent rate was measured surreptitiously while students in Grades 3–12 were reading a passage at their own rate prior to answering questions on it, and the objective measure used was the Rate Level Test (Carver, 1987b). The correlation between these two measures was .99 when correlated for attenuation.

If MORR is a valid indicator of rauding rate, R_r, then it should be: (a) highly related to typical silent reading rate, and (b) highly related to test scores purporting to reflect rauding rate. These hypothesized relationships were studied by analyzing data collected from elementary and secondary students who participated in a computer-assisted reading diagnosis.

METHOD

Subjects

A notice was placed in the newsletters of urban parochial schools close to the university where the testing took place explaining that a computer-assisted reading diagnosis was being given free. When a parent called or wrote to inquire about the project, an explanatory letter was mailed together with a volunteer form. Those who returned the form were scheduled for testing. The tests and measures described below were administered as part of a larger battery designed to provide the reading diagnosis.

The students tested varied from Grades 2 to 12, and were attending 12 private parochial schools. There were 44 students who had no missing data on any of the measures. The mean and standard deviation of their grade in school were 6.4 and 2.6, respectively. Their reading ability appeared to be slightly above average since their mean and SD on the Accuracy Level Test (Carver, 1987a) were 6.7 and 3.1, respectively. Of the 44 students, there was only one reading below second-grade level.

Measures

Typical silent reading rate was measured by asking students to begin reading a 100-word passage when it appeared on the screen of a computer. They had been told earlier that they should read the passage once to themselves and when finished they would be asked to read the words aloud as fast as they could. They were also told to press the space bar when they finished reading the passage; this instruction was also typed at the end of the passage.

The passage was taken from the 330 studied by Bormuth (see Carver, 1984a). It contained 105 words and was at the second-grade level of difficulty according to the Rauding Scale of Prose Difficulty (Carver, 1975). Rate was measured in standard words per minute (SWPM) by dividing the number of standard length words in the passage, 88.0, by the time taken in minutes. A standard length word consists of six character spaces (Carver 1976). This rate variable was called Typical Silent Reading Rate (TSRR) because individuals ordinarily read at a constant rate that is typical for them unless forced to shift out of this normal rate by the demand conditions of the situation (see Carver, 1981; 1983).

Immediately after the passage had been read silently it was presented again for reading aloud. (There was no measure of comprehension in the silent reading or the oral reading.) The individuals were told to read the passage aloud as fast as they could. This time the examiner pressed the space bar to designate when the student started and finished reading. The computer had been programmed to record the time and calculate the rate. Again, rate was measured in SWPM, and this variable was called Maximum Oral Reading Rate (MORR).

The Rate Level Test (Carver, 1987b) purports to provide an objective indicator of rauding rate. It is a 2-minute timed test requiring individuals to select the correct words in passages as fast as they can. There is an item every four words of the passage. Each item consists of two words; one is the actual word taken from the passage and the other a wrong word that does not make sense—a modified cloze test. The passages are at second-grade level of difficulty. Form A of this test was administered using a computer. According to the test manual raw scores can be transformed into estimates of rauding rate, in SWPM. Individuals must have a raw score higher than 10 on this test to be considered as having a valid score, so individuals scoring lower than 10 were not included. The resulting variable was called Test Estimated Rauding Rate (TERR).

RESULTS

Maximum Oral Reading Rate, MORR, correlated highly with Typical Silent Reading Rate, TSRR, .79. However, TSRR had a slightly higher mean (159 vs. 143) and a considerably higher standard deviation (SD) (60 vs 43). The absolute differences between the 44 pairs of rates on these two variables were calculated and the median was 19.5 SWPM.

MORR also correlated highly with Test Estimated Rauding Rate, TERR, .81. Furthermore, means and standard deviations of MORR were very close to those of TERR (means = 143 and 156; *SD*s = 43 and 41). The absolute differences between the 44 pairs of rates on these two variables were calculated, and the median was 21.4 SWPM. The median of the corresponding absolute differences between TSRR and TERR was 27.6 SWPM, so MORR was more closely related to Typical Silent Reading Rate than was Test Estimated Rauding Rate.

The partial correlations among MORR, TSRR, and TERR controlling for grade were calculated, and then subjected to a principle components factor analysis. Only one factor resulted and it accounted for 75% of the variance. The three factor loadings were as follows: MORR, .89; TSRR, 86; and TERR, .86. These data indicate that a single factor explains the relationships among the three variables. It seems reasonable to interpret this factor as rauding rate, R_r. Therefore, MORR seems to provide a very good measure of rauding rate because it loaded higher on this factor than the other two measures.

DISCUSSION

The maximum oral reading rate, MORR, of students in elementary and secondary schools appears to be a valid indicator of their rauding rate, R_r. A single, brief measure of MORR differed only about 21 SWPM, on the average, from an estimate of rauding rate from an objective test. This measure of MORR differed only about 19 SWPM, on the average, from a single, brief measure of typical silent reading rate. Furthermore, results of the factor analysis indicated that: (a) all three variables were measuring the same factor, (b) this factor appeared to represent individual differences in rauding rate, R_r, and (c) MORR seems to have measured R_r slightly better than the other two variables.

These data suggest that MORR provides a highly valid indicator of rauding rate, R_r, for elementary and secondary students. It appears that the rauding rate of students can be objectively and validly estimated two ways: (a) by asking a student to read aloud an easy passage as fast as possible, and (b) by administering the Rate Level Test. These two indicators of rauding rate in SWPM are not only highly correlated, but also closely match each other in absolute size. Furthermore, MORR appears to be a slightly better predictor of typical silent reading rate than scores on the Rate Level Test.

The high relationships resulted even though the individual scores came from very short samples of behavior. The measure of SWPM from the Rate Level Test involved only a 2-minute sample, whereas the measures of silent rate and oral rate each involved only 1-minute samples, or less. Such short samples undoubtedly produced measures that were less than perfectly reliable, yet the resulting relationships were still high. With respect to the reliability of typical silent rate, Carver (1986) found that two short measures of silent rate matched each other with an average difference of 25 SWPM for students in Grades 3–12. The measure of MORR was only about 19 SWPM different from silent rate, on the average, and this match between silent rate and MORR is probably just as close as each would match itself if measured a second time.

When silent reading rate is measured by the time taken to cover a passage, it is susceptible to many unknown influences because no overt behavior is being monitored during the elapsed time. Individuals can skip words and sentences, or they can stop and think about something else, and there is no simple way to control for these possible threats to the validity of the measurement. MORR involves continuous overt behavior so that the above threats are avoided or controlled. Yet, why did MORR match silent rate so closely? Individuals ordinarily read aloud slower than MORR when they are expected to comprehend (see Poulton & Brown, 1967). On the other hand, silent rate was measured in a manner which very likely involved high comprehension (see Coke, 1974). It seems likely that the extra time taken to pronounce words aloud during MORR happens to match the extra time required to comprehend during silent reading so that the trade off is equal, making the two rates in SWPM almost identical for elementary and secondary students. This close match may not hold for college students and adults. It should not be forgotten that MORR was measured after the passage had been read silently.

This research focused on MORR as an indicator of rauding rate, which is a relatively new construct. However, MORR has a long history. Huey (1908) seems to have investigated the silent, oral, and maximum oral rate of graduate students. In 1964, Morton measured maximum oral reading rate of university students reading statistical approximations to English. In 1977, Biemiller investigated the development of maximum oral reading rate from second grade through sixth grade. However, more recent reading researchers have generally focused on comprehension and ignored rate; for example, the *Handbook of Reading Research* only briefly mentions oral and silent reading rate (Pearson, 1984). Yet, standardized tests of reading comprehension are predominantly timed tests, so they are influenced by individual differences in rauding rate, R_r (Carver, 1988). Furthermore, those researchers who give untimed measures of comprehension to avoid any influence of rate have not succeeded, probably because accuracy scores are likely to increase with the time taken to read (Carver, 1984b). Therefore, rate is still involved in these measures because those students who can be motivated to read material more than once, or trained to slow down their rate, will have higher comprehension scores (see Carver, 1982). Rate, in general, and rauding rate, in particular, appear to be very important determiners of how much individuals comprehend when they read passages.

Now there is evidence that maximum oral reading rate, MORR, provides a valid indicator of rauding rate for students at the elementary and secondary levels. Furthermore, if a student has a MORR of 150 SWPM, for example, then it is highly likely that this student will read relatively easy material silently at approximately 150 SWPM. Simply asking students to read a relatively easy passage aloud at their fastest rate appears to provide a quick and valid indicator of their rauding ability and their typical silent reading rate.

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MULTIPLE MEASURES OF PRIOR KNOWLEDGE: COMPARATIVE PREDICTIVE VALIDITY

Sheila W. Valencia
University of Washington

Anne C. Stallman
University of Illinois—Champaign-Urbana

The importance of prior knowledge in reading comprehension has been well-documented (e.g., Anderson, 1977; Anderson & Pearson, 1984; Collins, Brown & Larkin, 1980; Rumelhart, 1980; Spiro, 1980). What students know about a topic greatly influences how well they comprehend what they read. To date, most research has focused on two evolving areas—the first, establishing the relationship between prior knowledge and comprehension (e.g., Anderson, Reynolds, Schallert, & Goetz, 1977; Bransford & Johnson, 1973; Dooling & Lachman, 1971; Pichert & Anderson, 1977) and the second, more recent, focusing on the direct measurement of prior knowledge (e.g., Alvermann & Hynd, 1987; Alvermann, Smith, & Readence, 1985; Anderson & Smith, 1984; Callahan & Drumm, 1984; Hare, 1982; Hare & Devine, 1983; Davey & Kapinus, 1985; Domaracki, 1984; Langer, 1984; Langer & Nicolich, 1981; Lipson, 1982; Maria & Blustein, 1986; Marr & Gormley, 1982; Stevens, 1980).

Researchers in both these areas have focused on understanding the important relationship between comprehension and prior knowledge. Although the progression from establishing existence of a relationship to measuring its effect is a logical one, there remains an interesting, yet unexamined assumption surrounding both lines of research. Specifically, both have relied on the implicit assumption of the validity of the prior knowledge measures.

In the first series of studies, this was achieved indirectly. Topics were identified as familiar and unfamiliar to the targeted subjects (e.g., quantum physics, chemistry) or various perspectives were assigned to the readers (e.g., home buyer/burglar). In the second series of studies, a variety of more direct measures such as vocabulary, multiple-choice items, and free responses (e.g., Holmes & Roser, 1987; Johnston, 1984; Langer, 1984) were used and quantified, but few were accompanied by documentation of efforts to validate the measures. Additionally, most studies relied on a single measure of prior knowledge, assuming it was a valid and reliable measure of the construct.

More recent research however, has suggested that issues of validity are far less clear than anticipated; different measures of prior knowledge appear to tap different information. Thus, the most complete measure of prior knowledge would seem to be one which includes multiple measures (Valencia, Stallman, Commeyras, Pearson & Hartman, in press). In other words, as one might suspect from schema theory, prior knowledge is a multidimensional construct, and various assessment strategies seem to measure somewhat different aspects of that knowledge.

These most recent findings have raised several new questions relative to prior knowledge and reading comprehension. Although we have reason to believe that multiple measures provide the most complete assessment of prior knowledge, we do not know the relationship of each measure to comprehension. Specifically, this study examined the following questions:

1. What are the correlations of several different measures of prior knowledge with comprehension of narrative and expository texts?
2. Do these measures differentially predict comprehension?
3. Do students comprehend better after engaging in a specific prior knowledge task before reading?
4. What is the relationship between general reading ability and different measures of prior knowledge?
5. Can the results from one measure be generalized to other measures, other texts, other grade levels, or students of varying abilities?

METHOD

Approximately 600 students in each of four grades (3, 6, 8, and 10) from randomly selected schools participated in the study. Students were assigned by school to one of three treatments. One third of the students completed multiple-choice prior knowledge tests, one third completed open-ended prior knowledge tests, and one third served as a control, taking no prior knowledge test. Immediately after responding to each prior knowledge task, students at each grade read the accompanying grade-appropriate passage—a complete, full-length selection—and answered 15 multiple-choice comprehension questions. This procedure was followed for a total of eight passages, one narrative and one expository passage at each grade level.

Instrumentation and Scoring

The multiple-choice prior knowledge measure. This pencil and paper measure of prior knowledge was developed as part of the pilot study for the Illinois Goal Assessment Program in Reading (Valencia & Pearson, 1987). Students' knowledge about a topic was assessed in response to a prompt encouraging them to think about what they knew about a specific topic, story line or theme, in the context of a particular type of selection. For example:

> Today you are going to read a story about a girl who decides to open a pet-sitting service. Think about what the girl might do, how she might feel and what might happen in such a story.

or

> Today you are going to read an article about how animals protect themselves from other animals. This article is like the information you might read in a science book or

> library book. Think about how animals hunt one another for food and about how the hunted animals are able to defend themselves from being attacked or caught.

Then students were asked to use this knowledge to predict the likelihood that specific ideas might appear in a passage on this topic. These predictions took the form of 15 multiple-choice statements with the following options: YES-likely to be in the passage, MAYBE-could be in the passage, and NO-unlikely to be in the passage. The statements represented a range of predictions from those that might be generated by experts on the topic to those typified by the novice. All item statements were categorized on two continua, one representing this expertise, and the other representing degree of relatedness to the topic (Yes, Maybe, No).

Both the prompts and statements were developed by analyzing the content and the conceptual focus of each passage. Using this information, several key concepts and important background information were identified as critical to understanding the passage, and then these ideas were incorporated into the prior knowledge measure.

Items were scored using a "discrepancy from expert" model. An expert answer key was developed by administering each test to three groups of experts (the test designers, adults, and students from a higher grade level). Validation using all groups was required before a response was assigned to a scoring key category. That is, all three groups had to agree on the classification of the statements, or there had to be an indication that evolving expertise (e.g., more sophisticated or in-depth understanding of the concept) could be associated with increased age and development.

Student responses were assigned points based on degree of agreement with the expert key. Students could receive full credit, partial credit, or no credit for each response.

The open-ended prior knowledge measure. The open-ended measure presented students with the identical prompt used in the multiple-choice format. Instead of rating a set of probable ideas, students were required to write ideas they thought the passage would include. All students were assured that ideas were of primary importance; spelling and handwriting would not be scored.

The process of scoring open-ended responses involved a series of steps. The first was to create templates for the eight topics. The templates represented a complete knowledge base for students at each grade level in the study, derived by compiling all information collected for all students.

The second step was to organize ideas on each template according to three levels of conceptual complexity determined a priori: Level 3 ideas were superordinate concepts, Level 2 ideas were subordinate concepts, and Level 1 ideas were related details. For example, for the animal defenses topic, predator and camouflage were judged to be Level 3 ideas, while examples of predator/prey relationships, such as "bird and worm", were judged as Level 2 ideas. Ideas conceptually related to Level 2 ideas, such as "seasons" or "nests," were categorized as Level 1 ideas. Additionally, a separate tally was kept for ideas that represented misinformation.

The final step was to use the key built in step 2 to score ideas given by each student for a given topic. Categories were converted into points to create "conceptual richness" scores. Responses at the highest level of conceptual richness, Level 3, received a score of 3; those at the next level, Level 2, received a 2; those most subordinate were scored 1. No credit was given for unrelated or redundant ideas, nor was credit subtracted for misinformation.

The comprehension measure. The comprehension measure for each passage consisted of 15 multiple-choice questions designed to evaluate students' abilities to construct an integrated understanding of the text. Questions were developed from an in-depth analysis of each text to identify the most important ideas and the relations among those ideas. Students were required to integrate information across large segments of text and to engage in inferential and complex reasoning to answer the comprehension questions. Thus this measure, although multiple-choice in format, represented a wide departure from the traditional literal, subskills focus of most multiple-choice comprehension measures (see Valencia & Pearson, 1987). Reliability of these measures ranged from .86 to .90 across the eight tests.

The measure of achievement. The Reading Section of the Metropolitan Achievement Test (MAT6, Elementary, Intermediate, Advanced I Levels, Prescott, Barlow, Hogan, & Farr, 1986) was administered to all subjects. Scores were used as covariates to address differences in general reading achievement.

RESULTS

Means and standard deviations for prior knowledge, narrative and expository comprehension, and standardized achievement scores are reported in Table 1. Prior knowledge and comprehension scores are reported as percents; Metropolitan Achievement scores are expressed as Normal Curve Equivalents (NCEs).

The first series of analyses focused on the relationship between prior knowledge and comprehension by examining correlations of different measures of prior knowledge with comprehension of narrative and expository texts. Results of first order correlations (see Table 2) indicated that, in general, correlations between prior knowledge and comprehension were more likely to be significant for expository topics (70% of the time) than for narrative topics (40% of the time). Although we found this to be a trend, there was a great deal of variability even within genre. For example, the multiple-choice "yes/maybe/no" prior knowledge format was significantly correlated with comprehension of expository passages for Grades 3, 6, and 10, but not for Grade 8. For the narrative passages, the correlations were significant only for Grades 3 and 6. In contrast, the open-ended measure was significantly correlated with comprehension of expository passages for Grades 3, 8, and 10, and for narrative passages only at Grade 10. There was great variability in the prior knowledge-comprehension relationship and no clear indication that one type of prior knowledge measure was more consistently associated with comprehension of a specific text type or developmental level.

A further analysis of the relationship between prior knowledge and comprehension was conducted by partialing out the effects of achievement. Partial correlation coefficients were consistent with the first analysis; the same correlations were significant and they were approximately twice as likely to be significant for expository texts than for narrative texts. Thus, we found differences in achievement level did not differentially influence the prior knowledge-comprehension relationship.

Table 1

Means (and Standard Deviations) for Narrative and Expository Passages and Achievement by Test Format

	Narrative*		Expository*		Achievement**	
Test Format	*M* (%)	*SD*	*M* (%)	*SD*	*M* (NCE)	*SD*
Grade 3						
Multiple-Choice					58.93	18.47
Prior Knowledge	57.91	16.96	55.78	20.58		
Comprehension	76.93	22.72	61.71	22.93		
Open-Ended					57.98	18.71
Prior Knowledge	35.60	18.28	41.51	22.72		
Comprehension	78.88	12.35	73.61	11.24		
No Prior Knowledge					58.57	18.48
Prior Knowledge	—	—	—	—		
Comprehension	80.50	18.96	63.71	20.97		
Grade 6						
Multiple-Choice					52.55	19.85
Prior Knowledge	72.68	13.73	64.04	15.19		
Comprehension	77.23	17.99	62.47	24.53		
Open-Ended					60.08	18.09
Prior Knowledge	51.00	17.54	44.32	22.70		
Comprehension	79.57	7.77	76.66	12.26		
No Prior Knowledge					57.81	19.07
Prior Knowledge	—	—	—	—		
Comprehension	79.07	16.22	56.17	29.75		
Grade 8						
Multiple-Choice					53.84	19.47
Prior Knowledge	58.33	26.63	56.21	14.83		
Comprehension	62.77	21.29	57.37	23.92		
Open-Ended					57.19	16.84
Prior Knowledge	32.15	19.82	38.56	20.24		
Comprehension	64.17	18.10	50.97	28.73		
No Prior Knowledge					58.51	16.84
Prior Knowledge	—	—	—	—		
Comprehension	65.30	19.23	58.51	16.84		
Grade 10						
Multiple-Choice					57.60	20.57
Prior Knowledge	60.25	21.44	69.99	13.83		
Comprehension	69.33	18.50	68.50	28.34		
Open-Ended					53.77	20.01
Prior Knowledge	37.32	18.76	33.18	16.36		
Comprehension	66.76	20.44	63.74	27.41		
No Prior Knowledge					58.02	19.57
Prior Knowledge	—	—	—	—		
Comprehension	71.83	19.07	72.37	22.29		

*Prior knowledge and comprehension scores are expressed as percents. **Achievement scores are expressed as Normal Curve Equivalents.

Table 2

Correlations Between Prior Knowledge and Comprehension by Test Format

	Narrative	Expository
Grade 3		
Multiple-Choice	.37*	.24*
Multiple-Choice	.18*	.02
Open-Ended	.13	.25*
No Prior Knowledge	—	—
Grade 6		
Multiple-Choice	.23*	.20*
Multiple-Choice	.10	.30*
Open-Ended	−.03	.14
No Prior Knowledge	—	—
Grade 8		
Multiple-Choice	.13	.02
Open-Ended	.05	.21*
No Prior Knowledge	—	—
Grade 10		
Multiple-Choice	.06	.17*
Open-Ended	.27*	.31*
No Prior Knowledge	—	—

*$p < .05$.

A second interesting question about these correlations was whether the two measures differentially correlated with comprehension. Using Fisher's Z we calculated differences between the correlations and found that, in general, there were no significant differences between correlations of prior knowledge and comprehension when comparing multiple-choice and open-ended formats. This can be interpreted to mean that the magnitude of the relationship between prior knowledge and comprehension is similar irrespective of the format used to measure prior knowledge. The similarity in correlations does not mean, however, that the same types of knowledge were elicited in each format. In fact, a closer inspection of one grade, Grade 10, revealed that for the narrative passage, 80% of the ideas which students answered correctly on the multiple-choice format were not found in their open-ended responses, and 92% of open-ended responses generated by students were not found on the multiple-choice test. A similar finding was evident for the expository passage; 50% of multiple-choice ideas answered correctly by students were not found in their open-ended responses and 91% of those generated were not included on the multiple-choice test. This finding is consistent with earlier work (Valencia et al., in press) which highlighted differences in information obtained from various prior knowledge tasks. Thus, in general, it appeared that the two measures did not differentially predict comprehension.

The next step was to see whether different types of prior knowledge measures affected students' comprehension scores in different ways. In other words, as suggested in our third research question, (a) Did students' comprehension differ depending on whether they took the multiple-choice format or the open-ended format and, (b) Did students' who engaged in any type of prior knowledge task comprehend better than students who did not engage in a prior knowledge task?

Using ANCOVA, covarying on the standardized achievement test score, comprehension scores were compared for students taking the two types of prior knowledge tests. The analysis revealed that, in general, there was no difference in comprehension scores between those students who took the multiple-choice prior knowledge test and those who took the open-ended format; only one out of eight findings, the sixth-grade narrative, revealed a significant difference in performance and this favored the open-ended format. Thus, format of the prior knowledge task was not a factor contributing to comprehension.

When comparing students who took no prior knowledge test with those who did, there were significant differences for only two of eight passages; third-grade narrative comprehension was higher for those who did not take a prior knowledge measure than for those who took the multiple-choice format, and at eighth grade no prior knowledge test resulted in higher expository comprehension scores than both the multiple-choice and open-ended formats.

These patterns seem to indicate that, overall, engaging in a particular type of prior knowledge task does not facilitate better comprehension. There were also no consistent comprehension differences between students who engaged in these activities and students who did not complete any prior knowledge activity at all. One explanation may be that these particular tasks did not activate prior knowledge that readers did not activate spontaneously during reading. Another possibility may be that knowledge contained in these tasks did not provide information that was additionally useful in comprehending the texts. On the other hand, results also indicate that these measures did not interfere with comprehension—they simply permitted it to be assessed.

Another question related to the relationship between general reading ability and different measures of prior knowledge. This question had two components: (a) Did these measures operate differently for children of different abilities and, (b) How much additional variance could be explained over and above measures of general ability? Using regression analyses in which achievement scores were entered first followed by test format, results generally revealed that these test formats did not differentially predict comprehension for children of different ability levels. In only one case was there a significant interaction between achievement and test format; at third grade, the multiple-choice format seemed to interfere with comprehension for low achieving students, making their scores significantly lower than scores of the low achieving students who did not complete any prior knowledge activity. This might be due to the possibility that younger and poorer readers may be influenced by misconceptions and hold to inappropriate ideas presented in the multiple-choice task in spite of contradictions they came across during reading. It is interesting, however, that this was not a problem in any other cases at third grade, or at any other grade level.

Regression analysis revealed, not surprisingly, that achievement was always a significant factor in comprehension. The next question however, was whether prior knowledge accounted for any additional variance in comprehension scores, above and beyond that which was attributable to achievement? For narratives, prior knowledge was only significant for one test format at third grade, but for expository passages it was significant for 7 out of 8 formats. Once again, there are trends for expository comprehension and prior knowledge that are not evident for narrative texts.

Still another issue was whether the relationship between comprehension and achievement was the same as the relationship between prior knowledge and achievement. Although correlations between comprehension and achievement were consistently significant and moderate, ranging from .35 to .64, correlations between prior knowledge and achievement were significant only 40% of the time and ranged from −.002 to .32. This suggests that the relationship between prior knowledge and comprehension is different than the relationship between prior knowledge and achievement.

Because of differences in these relationships, the range of prior knowledge scores for low, middle, and high achieving students was examined. Results were consistent for all grade levels; there was little difference in range of prior knowledge scores for students of different abilities. There were low ability readers who had as much prior knowledge on some topics as high ability readers, and there were readers of all achievement levels who did not know much about some topics and performed at chance levels on the prior knowledge tasks. Therefore, there is additional evidence that these prior knowledge tasks are measuring something other than overall achievement or general ability.

DISCUSSION

Results point toward a complex model of prior knowledge—one that is idiosyncratic depending on the reader and the text, and one that is comprised of different facets of knowledge. Although we have converging evidence that prior knowledge is distinct from ability, we also acknowledge that this difference is variable; it depends on topic, text, and probably the assessment task itself.

Evidence also suggests that comprehension of narrative texts seems to be less dependent on prior knowledge than comprehension of expository texts, at least in the ways we have come to define prior knowledge. Perhaps there are other facets of prior knowledge (e.g., text structure, analogous knowledge, affective factors, perceptions of relevance, accessibility, etc.), different from the more familiar prior knowledge of content, that have yet to be operationalized and assessed. Yet, of course, simply possessing that knowledge, whatever it may be, does not assure that a reader is willing or able to use it to support comprehension. Similarly, knowing there are multiple facets of prior knowledge does not assure that all are equally important in comprehension of various types of texts. It is likely these new facets will require new and innovative assessment strategies. These issues deserve attention; at this point, our findings simply suggest that results cannot be generalized across genres, topics, ability levels, or test formats.

The findings must also be interpreted with respect to the nature of the texts used; the texts were naturally occurring narrative and expository selections students might normally read. That we have failed to show as strong a prior knowledge-comprehension link as previous research has may be a function of this factor.

Naturally occurring texts are probably more interesting, more "considerate," contextually richer, and less ambiguous than texts used in many earlier studies, thus making impact of prior knowledge less critical to comprehension of these texts.

Finally, although different prior knowledge measures may not differentially predict magnitude of the prior knowledge-comprehension relationship for naturally occurring texts, different measures do seem to tap somewhat different aspects of the construct. The role of test constructors thus becomes critical to its assessment; by designing measures of prior knowledge, they predetermine the nature, structure, and scope of prior knowledge that they assume are implicated in comprehension. Researchers and practitioners must acknowledge the building evidence that prior knowledge is a multidimensional construct requiring multiple measures.

It seems that with such conclusions looming on the horizon, several new lines of research will need to emerge. Researchers will need to elaborate what is meant by the term "prior knowledge" and explore ways in which its many components come together in a variety of situations to enable comprehension. In many ways, these directions for future research truly seem to embody the complexity of an interactive view of reading.

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THE ATTITUDES OF TEACHERS TOWARD STANDARDIZED TESTS AND PERCEPTIONS OF THE IMPACT OF THESE TESTS ON CURRICULUM

Pamela Ross and Carolyn Colvin-Murphy
San Diego State University

According to Archie E. La Pointe, executive director of the National Assessment of Educational Progress, the amount and influence of standardized testing in the United States is now greater than at any time in history (Fiske, 1988), with estimates of the number of such tests administered ranging from 100 to 200 million a year (Daley, 1976; Fiske, 1988). Until recently, generally positive attitudes toward standardized tests have been reported by teachers (Beck & Stetz, 1979, 1980; Goslin, 1967; Kellaghan, Madaus, & Airaisian, 1982; Ruddell & Kinzer, 1982; Ruddell, 1985; Stetz & Beck, 1980). However, most teachers indicated that they had received minimal exposure to formal training in test and measurement techniques and that districts did not provide clearly formulated policies specifying what they were to do with the results. Furthermore, with few exceptions, it appeared that such tests had relatively little influence on the curriculum and, overall, teachers reported making little use of the results. At best, scores were described as serving only a confirmatory or supplementary role relative to information already possessed by teachers. Ironically, the more testing done by a district, the less results were actually used (Salmon-Cox, 1981). It was also reported that although administrators generally did not use test scores in central office decision-making, they supported testing programs because they believed the information was helpful to building-level personnel (Sproull & Zubrow, 1981).

In 1981 Madaus speculated that test programs were at that time of little consequence to teachers and administrators because results were not used as an administrative mechanism through which particular educational policies were implemented. More recently, however, the same author described a gradual shift from local use of standardized test scores to that of a tool used to establish and implement state and federal educational policies (Madaus, 1985). He alluded to evidence that, in New Jersey and New York, teachers are teaching to tests. In California, studies have hinted at the negative impact of testing on the curriculum in the form of time spent teaching test-taking strategies and even in review of expected questions (Ruddell & Kinzer, 1982), as well as growing concern about redundancy in testing (Ruddell, 1985). The present study, supported in part by a grant from the San Diego State University Foundation, was designed to investigate and document more fully the current attitudes of teachers in California toward tests and their perceptions of the impact of these tests on the curriculum.

METHOD

The subjects of this study were 90 elementary classroom teachers, K through 6, selected from schools representing 11 districts cooperating with a major Southern California teacher education institution. The sample was randomly drawn from 150 respondents who agreed to be individually interviewed by the researchers concerning standardized tests. Teachers in the sample had an average of 17 years experience. Of the sample, 17 were drawn from small suburban, 38 large suburban, and 35 large urban school districts. Local county office of education statistics used to assign SES status to the schools in which the teachers taught indicated that 15 teachers represented low, 55 were from middle, and 20 from high SES schools.

Subjects first completed a 24-item semantic differential instrument measuring their views of student attitudes toward these measures as well as their own views of standardized tests. Nine items specifically assessed teacher attitudes concerning the validity, usefulness, and importance of such instruments as well as the degree to which tests were unbiased and helpful to the learning process. Five response categories were provided for each item with the position of positive and negative polar adjectives occasionally reversed to prevent random marking of responses. Extensive structured interviews followed in which teachers were asked to respond to questions designed to probe their attitudes toward, perceptions of, and knowledge about standardized tests. Topics covered included the following:

1. What standardized achievement tests are given?
2. How often are they given and to what grade levels?
3. What is the purpose of achievement tests?
4. How accurate are they in evaluating students' abilities and assessing teachers' teaching skills?
5. What use is made of their scores?
6. What decisions are based upon them?
7. How well do they mesh with and in what ways do they influence the curriculum?
8. How much time is spent coaching students on test content or format?
9. What materials, if any, especially designed to enhance test scores are used?
10. Should the use of standardized tests be eliminated or modified in some way?
11. What are the major differences between standardized achievement tests and criterion-referenced measures typically correlated with basal readers?

All interviews were tape recorded and transcribed. Statements from the structured interviews were analyzed question by question. Response categories for each question were developed by the researchers from a review of all content supplied by teachers for a given item. For example, teachers supplied 256 responses to the question, "What is the purpose of standardized tests? Why do you think you give them?" These replies were classified into eight categories. All nonredundant responses were then coded on the transcriptions as fitting one of the categories. If both researchers did not agree about the classification of an item, a third opinion was sought. The number of responses across all interviews coded to each category was tallied. Results were reported descriptively. Since teachers tended to generate multiple responses to a question, the information reported, except where indicated, represents the tenor of remarks made rather than the percent of teachers who gave a specific response.

RESULTS

In analyzing the results of the semantic differential, the possible range of scores for any item was expressed as a number between 1 and 5. Items marked next to a negative polar adjective received a score of 1 and those marked next to a positive polar adjective a score of 5, with the remaining values, 2, 3, and 4, distributed in between. Higher scores consistently reflected positive attitudes toward achievement tests, with scores of 1 and 2 construed as largely negative, a score of 3 neutral and scores of 4 and 5 positive in nature.

Findings of the semantic differential revealed that teachers projected neutral to mildly positive attitudes toward standardized tests for their students. No significant differences in these projections emerged due to demographic variables when data were analyzed using ANOVA and MANOVA techniques. Although teachers themselves generally responded neutrally to tests ($\overline{X} = 3.18$), teachers of low SES students and teachers in urban schools were significantly more positive about standardized tests than their counterparts in high SES and suburban schools, $F(1, 32) = 5.92$, $p < .02$ and $F(1, 84) = 4.62$, $p < .04$, respectively.

Despite the generally neutral reaction to standardized tests reflected by the item mean scores, evidence that a significant number of teachers held negative attitudes in specific areas emerged when the number of responses with a value of 1 and 2 for each item were tabulated. Through this procedure it was determined that 54% of teachers thought tests were biased and 44% found them not helpful to the learning process. By contrast, when the number of responses with a value of 4 and 5 for the latter two items were tabulated, only 15.5% of teachers thought tests were unbiased and 31% felt they were helpful to the learning process.

Analysis of the structured interviews revealed that nearly all schools (90%) required students in every grade, K through 6, to take standardized tests each year. The remainder administered tests to selected grades with kindergarten most commonly exempt from the test program. In addition, 40% administered district proficiency or competency tests. Ironically, given the magnitude of testing programs, few teachers appeared to understand fundamental test and measurement concepts. Inaccurate responses to questions designed to probe their knowledge about major theoretical differences between basal reader-correlated criterion reference measures and standardized reading achievement tests were provided by 81% of teachers.

Major purposes attributed to the use of standardized tests by school districts included monitoring individual student progress (33%), accountability/politics (25%), and funding (11%). A summary classifying uses made of test scores by teachers along with examples of statements under each classification can be found in Table 1. Many responses (33%) indicated that teachers used the results of these tests to analyze their own strengths and limitations and modify the curriculum accordingly. Other uses made of scores included relying on them for placement/retention or special referral (19%),

Table 1

Teacher Responses, Uses Made of Test Scores

Category	Number	Percent
A. Modify Teaching or Curriculum		
Curricular Evaluation	54	23.5%
Examples: Modify curriculum (areas to emphasize) Get overall picture of class		
Teacher Self-Diagnosis	23	10%
Examples: Analyze my curricular strengths/weaknesses Use to improve teaching		
B. Placement or Retention of Students	45	19%
Examples: Special education referral/recommendation Determine reading placement		
C. Individual Student Performance	37	16%
Examples: Look at individual growth/performance Consider/compare with other tests/assessments Flag students with discrepancies		
D. No Use	34	15%
Examples: File them/none/ignore		
E. Reporting to Parents	21	9%
Examples: Use in parent conferences Send home to parents		
F. Validation of Student Achievement	15	6.5%
Examples: Verification/validation of own perceptions		
G. Motivational Tool	2	1%
Examples: Use as motivational tool for students		
Total Responses Coded	231	

diagnosis/evaluation of students (16%), providing information to parents (9%), and validation of teacher perceptions of students (6.5%). A number of responses (15%) stated that no use whatsoever was made of the test scores.

The majority of teacher responses (76%) indicated that standardized tests had a significant influence on the curriculum. A summary of these influences and sample statements for each classification can be found in Table 2. The greatest impact took the form of efforts to align curriculum with test content (38%). Many statements alluded to conscious attempts to teach to the test (15%). Another 15% of responses indicated that

Table 2

Teacher Responses, Influences of Standardized Tests on the Curriculum

Category	Number	Percent
A. Significant Influence		
Global Influence	21	7%
Examples: Great deal of influence Increasing influence Tests emphasized by district		
Curriculum Alignment	109	38%
Examples: Curriculum driven by/meshed with tests Curriculum specifically written to match tests District expectancies written to match tests		
Teaching to the Test	42	15%
Examples: Consciously teach concepts covered by test Teach to test		
Dictates Order of Instruction	18	6%
Examples: Influences scheduling/pacing of subject matter		
Restriction of curriculum	14	5%
Examples: Must teach test-wiseness Takes time away from important issues Force focus on basic curriculum		
Influences textbook publishers	11	4%
Examples: Publishers/districts trying to align now		
Subtotal	215	76%
B. Some Influence	16	6%
Examples: Curriculum meshes somewhat Some influence		
C. No Influence	41	14%
Examples: Curriculum not well aligned, no match Feel no pressure Don't teach to the test Minimal influence		
D. Positive Influence	10	3.5%
Examples: Test gives me guidelines Helps focus on weakness of curriculum More time on task		
E. Other	2	1%
Total Responses Coded	284	

standardized tests dictated the order in which concepts were to be taught, restricted the curriculum, and influenced the contents of textbooks. Some (14%) saw tests as having little or no influence on the curriculum.

It is interesting to note, given the impact tests appear to have on education, that the picture they provide of student abilities was deemed inaccurate by 33% of teachers. Another 26% described tests as somewhat accurate and 20% felt accuracy varied. A total of 184 qualifying remarks were supplied by teachers describing conditions which worked against accuracy. Factors influencing student performance included affective variables (28%), range of test-taking ability (18%), the limited scope of the test (17.5%), and flaws in the test instrument itself (17.5%). In addition, nearly half the respondents (45%) indicated these measures provide an inaccurate evaluation of teaching abilities. Only 12% felt results accurately or very accurately reflected teaching performance and another 18% deemed tests as somewhat accurate. Once again, 20% felt accuracy varied. A total of 118 qualifying remarks alluded to conditions that diminished accuracy. The match between the curriculum and the test (44%), class make-up (18%), and the nature of the test instrument itself (15%) were considered leading causes of inaccuracy. Most teachers (63%) felt it was inappropriate for test scores to be used for teacher evaluation; however, 22% of the responses reflected the belief that this was a common practice.

Although time taken by teachers to prepare their students for standardized tests varied considerably, the picture that emerged was distressing to us. Of those interviewed, 42.5% said they spent 5 or more hours engaged in activities specifically designed to enhance test scores. Estimates of time spent ranged from 5 to over 90 hours of preparation with one fourth of teachers devoting more than 10 hours to this endeavor. Commercially-prepared materials aimed at boosting test scores were purchased and used for reading by 24% of teachers. District-written materials were used by 23% of teachers and 14% said they created their own practice materials. Finally, 29% of the interviewees indicated that they used the practice test provided by the test publisher itself. It was evident that various combinations of these materials were used by many.

When subjects were asked if standardized tests should be eliminated, although most of their responses (52%) stated a desire to see tests modified, a significant number (21%) were in favor of elimination. Suggestions for modification focused on changing the test instruments themselves so that they would better reflect the curriculum, test problem solving skills and critical thinking, and be briefer (45%). Modification of testing procedures was also heavily advocated (41% of responses) with intermittent testing or rotation of grades or schools tested among the suggestions.

DISCUSSION

It appears from the findings of this study that teacher attitudes toward tests are currently less positive than in earlier research. Even the overall neutral response to tests reported here belies the general teacher concern that tests are biased and not helpful to the learning process. It is of interest that teachers of low SES students and teachers in urban schools were significantly more positive about tests than their counterparts in high SES and suburban schools. Perhaps this may be explained by two variables:

funding and parental pressure. Teachers in low SES schools and urban schools receive funds for compensatory education programs as a result of poor test scores. Teachers in high SES and suburban schools, despite better than average test scores, reported feeling pressured by administrators and parents to perform even better. Although teachers in low SES environments may feel that a narrow, "back to the basics" curriculum is appropriate for their student population, teachers of youngsters who already have the basics may view pressure to produce higher scores as an invasion of the curriculum.

The implications of this study in terms of the influence of tests on the curriculum are profound. The authors of *Becoming a Nation of Readers* (Anderson, Hiebert, Scott, & Wilkinson, 1985) warned that "teaching to the test" would result as long as educators were accountable for performance on reading tests as they now exist. Indeed, evidence of a kind of "tautological curriculum," a curriculum driven by the goal of improving test scores alone, emerges from the data. What is on the test becomes more important than what is not. The various forms of "teaching to the test" described by teachers can be viewed as tantamount to test compromise. At best, the use of and preparation for standardized tests described by many of those interviewed in Southern California seriously distort the intentions of those measures. As Madaus (1985) pointed out, tests allow policy makers to sidestep the problem of dealing directly with the instructional process. When important rewards and sanctions are attached to the results of tests, testing is transformed into a coercive device that can influence curriculum and instruction. Under these circumstances, testing bullies the instructional system into line.

During the last 15–20 years we have acquired much knowledge about the reading process. Assessment has failed to be touched by the strategic view of reading that has been an outgrowth of that knowledge (Valencia & Pearson, 1987). Most standardized tests do not permit skilled readers to use strategies that are important in natural reading situations. Until tests match this knowledge, they will continue to have a pernicious influence on curriculum and instruction in reading. The alignment of curriculum with tests as they currently exist causes the narrowing of the content of that curriculum. If, as it has been suggested by research (Singer, McNeil, & Furse, 1984), a broader curriculum produces greater reading achievement than an emphasis on basic skills, we have a lot of work to do to reverse the current trends.

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REDUCING AMBIGUITY: A STUDY OF HOW STUDENTS AND TEACHERS MAKE SENSE OF SCHOOL

Martha Rapp Haggard
Sonoma State University

Students of all ages face ambiguity daily in the classroom. This ambiguity may be *intended,* such as open-ended assignments in which divergence and individuality are encouraged; or it may be *unintended,* when student response differs from the response anticipated by the teacher or text (Murphy, 1987). Doyle and Carter (1984) define ambiguity as ". . . the extent to which a precise and predictable formula for student action in generating a product can be defined" (p. 130). They found (1984) that high-achieving high school students, when asked to complete writing assignments that were intentionally ambiguous, both complex and loosely defined, persisted in clarification probes until the teacher reduced the complexity and increased the structure of the assignments. In effect, the tasks were disambiguated to the extent that "the tasks that were accomplished were substantially different from the tasks that were announced" (p. 145). Murphy (1988) in a study of unintentional ambiguity, found that fifth-grade students' unexpected (and incorrect) responses to procedural reading tasks occurred most frequently because students did not understand what the task was asking them to do. In the face of such ambiguity, students constructed their own definition of the tasks, thus arriving at answers unanticipated by teacher or text materials. The purpose of this study was to extend the line of inquiry developed by Doyle and Carter and Murphy, and to examine an additional aspect of ambiguity—the teacher's response to students' redefinition of task parameters. This aspect was considered exploratory, and was based on the notion that teacher response is as critical as student response in determining the effect of task ambiguity. That is, how teachers respond when students perceive a task to be ambiguous affects, in some way, what students learn from that instructional episode (Haggard, 1985; Roehler, Duffy, & Warren, 1988; Ruddell & Speaker, 1985). The following questions guided the study: (a) What do students do when faced with ambiguous literacy tasks? (b) What do teachers do to monitor student response to ambiguous literacy tasks?

METHOD

Phase I of the study was conducted over an academic semester during which the investigator was a participant observer in a fifth-grade classroom one morning a week for 15 weeks. The school is in a small, urban school serving a neighborhood of predominantly middle-class black families. In this classroom, 29 children were black; 2 were white. CTBS Total reading scores ranged from the 4th percentile (2.0 GE) to the 99th percentile (10.9 GE). Phase II occurred in the semester following Phase I, and was comprised of audiotaped structured interviews, conducted by the investigator, with selected students and the teacher.

Subjects

Subjects interviewed were 11 students, drawn from the class of 32, and the teacher. Students were selected to represent the achievement range in the class; however, selection was constrained by availability of students on the interview day. CTBS scores for these students ranged from the 8th to the 99th percentile, with some concentration at the upper percentiles: 7 students' scores were above the 75th percentile; 3 between the 30th and 74th percentile; and 1 below the 30th percentile. The teacher was an experienced teacher new to the school and class that year.

Procedures

Two literacy tasks were identified as ambiguous; one of these was believed by the investigator to represent *intended* ambiguity, and one to represent *unintended* ambiguity. Each is described below.

Daily Reading Assignments (intended)—The class was reading *The Lion, the Witch and the Wardrobe* (Lewis, 1950) using the study guide questions published by the Clovis (California) Unified School District. Questions/activities on the guide are divided into six categories: (a) knowledge ("What does Mr. Tumnus tell Lucy that frightens her?"); (b) comprehension ("Number these details [listed below] in the order in which they happened."; (c) application ("Is there a witch in another story that you have read that reminds you of the White Witch?"); (d) analysis ("Is a witch usually depicted in white? Why might the author have used a white witch in this story?"); (e) synthesis ("Write another ending for Lucy's visit to Narnia."); and (f) evaluation ("Compare Lucy and Mr. Tumnus. Are there any similarities?"). Some or all questions from each category were assigned for each reading segment. Students wrote out answers individually and shared these with their discussion groups. No grades were assigned to the written answers.

Weekly Spelling Assignments (unintended)—A standing assignment in the class each week was for students to write a story using all of their spelling words for that week. The spelling lessons were organized, in the traditional manner, according to spelling patterns (e.g., *qu*—quake, quiet, queen; *or*—forest, absorb, corner; *o + plural*—rodeos, echoes, tomatoes). Stories were read aloud in class and submitted for grading.

Data collected for these tasks included detailed observer notes, photocopies of task products, and the structured interviews. Student interviews lasted approximately 30 minutes, and included the following questions: (a) How do you go about answering reading guide questions? (b) How do you go about writing stories with your spelling words? (c) How does this [reading/spelling task] help you? and (d) Why do you think the teacher has you do this [reading/spelling task]? Additional follow-up and probe questions were asked as appropriate. The spelling books and samples of the reading guides from *The Lion, the Witch and the Wardrobe* were in front of the students during the interviews and were referred to when needed. The teacher interview was 40 minutes, and included the following questions: (a) How do you think students go about answering the reading guide questions? (b) How do you think students go about writing stories with their spelling words? (c) How do you think they view these tasks? and (d) How do you view these tasks? Additional follow-up and probe questions were asked as appropriate.

RESULTS

Student Response to Ambiguous Literacy Tasks

Students were able to describe, with varying levels of sophistication, their approach for completing both the reading and spelling tasks. For each task, 10 of the 11 students indicated both a task *goal* and a *plan*. Further analysis of their descriptions yielded three levels of response. These are summarized in Table 1. No effect for ability levels (as measured by CTBS scores) could be found.

Table 1

Number of Student Responses About How to Do Ambiguous Tasks by Level

Level	Reading Questions	Spelling Stories
Level I. Response Contains: Clearly defined goal and plan Elements representing declarative and procedural knowledge Focus on meaning and making sense Precise statement of procedural sequence Explicit reference to task elements; e.g., "words," "sentences," "questions," "reading"	2	6
Level II. Response Contains: Vaguely defined, general plans with little explicit or implicit reference to the goal Few, if any, elements representing declarative and procedural knowledge Few or no references to meaning or making sense Little or no statement of procedural sequence No explicit reference to task elements	8	4
Level III. Response Contains: Undefined goal and plan No elements representing declarative and procedural knowledge No explicit reference to task elements	1	1

A Level I response for *reading* was, "I know the questions are going to be asked, so I read carefully. After reading, I brainstorm what I know, and then go back to answer the questions." Level I *spelling* responses included "First I think about all the words and how to fit them into sentences. Then I fit sentences into stories. Then I add prefixes and affixes," and, "I look through words and find a word, for example 'twilight.' I look for another word that will fit. If I can't fit it, then I can fit another, like 'dough'."

Level II responses for *reading* were all virtually identical. "I go back to the book," or, "I look it up." Level II responses for *spelling* included, "I think of something and write the story down," and, "I just fit 'em in. I look around and find something."

The Level III response for *reading*, was, "I don't remember doing them." The Level III response for *spelling* was, "I don't know. It just comes up. I don't know."

A major finding for the reading task is that eight responses focused on literal comprehension. This is significant in light of the fact that four of the six categories of questions/activities assigned (application, analysis, synthesis, evaluation) were *intended* to be ambiguous; that is, they required constructed rather than reproduced responses (Doyle & Carter, 1984), and therefore required more elaborate working plans; they could not be completed correctly by "looking it up." Field notes corroborate student response to the reading task, however. With the exception of art-related activities (drawing, constructing), students focused almost all of their time on the literal level questions (knowledge, comprehension), during both the periods of individually writing answers and the periods of small group discussion. Questions from the higher level categories were sometimes discussed in whole class, but answers were rarely written out prior to that discussion. Since papers were not submitted for grading, there was no penalty for partial completion of the assignments. It appears that students disambiguated this task by reducing it to its lowest level, concentrating on the literal level questions to the exclusion of most others. This conclusion is reinforced by student response to the question, "Why do you think the teacher has you do this?". Not one student saw the reading guide activities as possible aids to understanding or extension of text; instead, responses were variations of "to see what we learned." Evidently students viewed the task as a test of their literal understanding of text, and responded accordingly.

The spelling task responses indicate that 6 of the 11 children had clearly defined, precise plans for writing stories; 4 of the others' plans were less precise, but were still plans. This could be interpreted to suggest that "precise and predictable formula(s) for student action in generating a product" (Doyle & Carter, 1984) were indeed available to students, thus negating the notion that the task itself was ambiguous. Confounding this, however, are work samples that suggest that even though students had well-articulated goals and plans for task completion, the finished products did not make sense. Below are samples taken from spelling stories written by the interview subjects:

> All *turtles* are always *tardy* to go to the *hardware* store.
>
> It *disturbs* me when people *depart* from their houses to worship darkness. They make the *worst* racket ever.
>
> Some people *regard* that I am *worthy* to *charge* people *further* more money than they can afford.

> *Force* had a *chance* to have a *dance* for *prince* policeman but they had to *replace* a man, so they *pounced* right on it and they *found* him.

If one believes that the point of school is to make sense, then the task of writing spelling stories must be considered to have some degree of ambiguity associated with it that is not simply procedural. Interesting also is that never once, during the entire 15 weeks, did anyone, students or teacher, suggest that these sentences and stories were nonsensical. Stories read aloud were greeted with applause and approbation. This writing, however, is *not* consonant with the same students' first draft writing, assigned by the investigator, in which students gave one character in *The Lion, the Witch and the Wardrobe* a magic object and wrote an episode of their choice. These writing samples are marked by fluency, sense of story, and clear focus on making meaning.

> While I was still inside the cave I heard Father of Christmas say, "Lucy Daughter of Eve I give you a very important gift. I want you to use it wisely. It will only give one opportunity to show your brother Edmund what you can do. It is a cape. It will make you invisible. Please remember to use it wisely. I must get going now. To you all a happy journey."
>
> Susan and I used the magic purse when we needed help. We were heading nearer the queen's castle. The witch came to get a drink. Susan and I ducked down.
>
> Lucy had just run out of the cave after the others. Nobody was in sight. Lucy thought maybe the White Witch took them. She ran back into the cave to get her magic cloak. She was determined to find her sister and brother, but first she had to meet Aslan.

Apparently, students disambiguated the spelling story task by constructing a special kind of writing task definition in which spelling stories differ substantially from real writing. Comparison of the spelling stories with the magic object writing drafts supports this position. Further, it supports Murphy's finding (1987; 1988) that students reduce unintended ambiguity by redefining task parameters, and her conclusion that such redefinition may occur because students have unclear or imprecise understanding of task goals. Only 3 students identified "to learn how to spell" as the purpose for writing spelling stories; other responses ranged from "to develop our minds," to "so you can have something to do while you're home." One of the best spelling story writers in the class, when asked why they wrote the stories responded, "I have no idea."

Teacher Monitoring of Student Response to Ambiguous Tasks

The teacher's observed classroom behavior and responses to questions about how students do the reading guide and spelling story tasks support conclusions drawn from student responses. Classroom discussion of reading guide responses, both small group and whole class, were irregularly held and of widely varying quality and length. When they did occur, discussion content usually reinforced students' view that the purpose of the task was to check literal comprehension. In the interview, the teacher acknowledged that students just "go through the motions" of doing reading guide assignments, thus suggesting that he has, in some way, accepted student reduction of the task from its intended focus on higher level thinking to looking up literal level answers.

The spelling story task presents a somewhat more complicated picture. The teacher's discussion of how students produce spelling stories highlighted "meaning" and "making sense," especially with regard to students' ability to produce "thematic" as opposed to "disjointed" stories. This is in direct contrast to the non sense stories which were produced, but does suggest that the teacher has disambiguated spelling stories in much the same way students have—by designating the spelling story task as a special kind of writing task unrelated to real writing. A major difference can be seen in the teacher response to unintended ambiguity reported by Murphy (1987) and that found here. Students in the Murphy study, when faced with literacy tasks that did not make sense to them, produced unexpected responses judged by the teacher to be both nonsensical and incorrect, even when reasonable logic for the response could be discerned. In this study, such was not the case: Students understood the task completely and carried it out exactly as the teacher intended; their efforts—nonsensical stories—were rewarded with public approval and high grades. It appears that the task of writing spelling stories carries with it a dimension of unintended ambiguity, previously unidentified, which does not produce unexpected (and incorrect) responses; rather, it produces expected (and correct) responses that do not make sense.

DISCUSSION

Results of this study support earlier studies' conclusions that students disambiguate classroom tasks by reducing tasks to low-level, rote assignments (Doyle & Carter, 1984) and by redefining task parameters (Murphy, 1987). In addition, the study extends Doyle and Carter's (1984) definition of amibiguity by introducing a new dimension of unintended ambiguity, a "making sense" dimension which goes beyond procedural concerns to address task content itself. In this study, such ambiguity apparently led students and teacher alike to redefine the writing task for spelling stories to maintain the belief that these stories do, in fact, make sense. Or, they may have believed that the goal of using all 20 words was so important as to override the need to make sense. Explanation for this can be found in Festinger's Cognitive Dissonance Theory (1957), which states that when an individual simultaneously holds two psychologically inconsistent cognitions, dissonance occurs. Since this state is unpleasant, the individual attempts to reduce it either by adding consonant cognitions or by changing one or both cognitions to make them fit together. With regard to spelling stories, students and teacher have evidently reduced the dissonance between what is commonly accepted as sense and nonsense by redefining the task as a special kind of writing with its own special sort of "sense." It appears, from these results, that the teacher's role is critical in determining the outcome of ambiguity in the classroom. Whether the source is intended or unintended, it seems reasonable to speculate that the teacher's response reinforces, and perhaps encourages continuation of, student response. In effect, an unspoken contract of agreement between teacher and students drives student behavior.

This leads, then, to additional questions concerning the nature of ambiguity in the classroom. In her discussion of task environment, Murphy (1987) suggests that current definitions of ambiguity may be so closely associated with task structure that sources of ambiguity external to the task are not acknowledged. This study supports her concern, and proposes further that nonprocedural task content variables may be yet another source of ambiguity in the classroom. The "making sense" dimension of ambiguity certainly needs much investigation. One must wonder why it is students sit in classrooms day after day and continue to do tasks that make no sense to them. We need additionally to know more about how high and low achievers handle ambiguity; maybe learning to "do" school (Dyson, 1984) requires skill in reducing ambiguity in particular ways, or perhaps the ability to tolerate certain kinds of ambiguity and reduce others. We need to examine types of ambiguity to distinguish that which debilitates and diminishes performance from that which stimulates intellectual tension and curiosity. And finally, we need a much more thorough understanding of the teacher's role in the complex interaction which creates, sustains, or reduces ambiguity in the classroom.

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STUDENTS' COMPREHENSION, WRITING, AND PERCEPTIONS IN TWO APPROACHES TO LITERACY INSTRUCTION

Patricia J. Hagerty
School District #12, Adams County, Colorado

Elfrieda H. Hiebert
University of Colorado at Boulder

Mary Katherine Owens
School District #12, Adams County, Colorado

In recent years, an alarming pattern has become evident in American children's school performances. Although students perform adequately on low-level tasks, they do poorly when tasks require application or problem solving (NAEP, 1989). On the last National Assessment of Educational Progress of reading, 81% of the third graders, 54% of the seventh graders, and 36% of the eleventh graders were unable to write a satisfactory response to the question "What do you think is the most important thing the author is trying to say?" after reading a page-long story (Applebee, Langer, & Mullis, 1988).

Such results are not surprising in light of the skills-oriented perspective that has guided reading instruction over the past several decades. In this perspective, proficient reading is regarded as the acquisition of a set of hierarchically ordered skills. Effectiveness of reading instruction is measured by students' mastery of skills, not by ability to compose text or synthesize the information in several passages to create a point of view.

The latter is the focus when reading and writing are seen as constructive and strategic processes. An extensive body of work verifies the manner in which classroom literacy environments can be designed so that tasks, texts, and contexts promote constructive, strategic processing. From cognitive psychologists such as Brown, Collins, and Duguid (1989) comes the idea that meaning-making occurs best when school tasks require authentic or meaningful uses of literacy, like writing letters to communicate or gain information. Linguists such as Davison (1984) have shown that the construction of meaning is facilitated when reading material has syntactic structures that are similar to those used in speech and consists of engaging stories or information (Bruce, 1984). Instructional psychologists such as Slavin (Stevens, Madden, Slavin, & Farnish, 1987) have shown that involvement in contexts similar to those in which people often interact outside the school, like cooperative settings, can aid children's learning.

Classroom teachers' familiarity with the constructive model of reading and writing has been through the whole language or literature-based approach. Teachers have responded enthusiastically to the message of authentic tasks, texts, and contexts. Theoretical support for such activities is strong (see, e.g., Anderson, Hiebert, Scott, & Wilkinson, 1985). Furthermore, the poor performance on application tasks of students who have spent their school careers in skills-oriented instruction supports the need for alternative forms of instruction. Regardless of this existing support for a constructive model, school board members, parents, and others measure the success of schools by scores on standardized tests. Evidence of this type may be needed, but information on measures that represent a vision of literacy that is broader than the limited view underlying standardized tests is also required.

In this study, several different student outcomes were examined as a function of participation in literature-based and skills-oriented reading and writing instruction. Student performance on a standardized test of reading comprehension was included, but so too were measures that represent a broader view of literacy. Information on students' thinking about reading and writing was also included because of suggestions that students' thinking about literacy processes and strategies may impact their facility in reading and writing (Baker & Brown, 1984). Writing samples were also gathered since students' abilities to generate coherent text were viewed as a critical outcome of school literacy programs.

In conducting this study, the difficulties in comparing data from intact classroom programs were recognized (Hiebert, 1987). One central problem with such studies lies in the fidelity of instruction to underlying philosophy. As Chall and Feldman (1966) have demonstrated, differences in instructional practices of teachers within the same programs frequently outdistance those across different programs. However, an observational investigation of some of the classrooms in this study showed substantial differences in literacy instruction that fell along the lines of the two philosophies (Fisher, Hiebert, & Hagerty, 1988). For example, an analysis of student latitude in choosing task products and processes showed that literature-based students were involved in more authentic tasks than skills-oriented students. The congruence between practice and philosophy notwithstanding, this study was regarded as an exploratory investigation of student outcomes in literature-based and skills-oriented classrooms.

METHOD

Subjects

Sample. The sample consisted of children from 12 classrooms in a middle-sized school district located in the suburbs of a large, western city. The 12 classes were divided evenly among Grades 2, 4, and 6, with half of the classrooms at each level implementing a literature-based program and half a skills-oriented program. During the reading and writing periods in the literature-based classes, children selected tradebooks to read and wrote extensively on topics of their choosing. Teachers conducted short lessons on strategies such as detecting author's mood in reading or creating a mood in one's writing, prior to children's reading and writing. Independent reading and writing periods were followed by small and large group sharing of students' compositions or interpretations of their reading.

In the skills-oriented classes, reading and writing periods consisted of teacher-directed instruction to ability groups or the whole class. When students were not working with the teacher, they were filling out teacher-assigned worksheets which provided practice on particular skills or reading assigned textbook passages. On several occasions a week in each of the skills-oriented classes, students read independently in tradebooks or textbooks which they had selected. Observations of the second- and sixth-grade classrooms which are reported elsewhere (Fisher et al., 1988) indicate that literacy experiences in the two types of classrooms differed markedly on a number of critical dimensions that characterize the individual approaches. Thus, the labels of literature-based and skills-oriented adequately describe students' instructional experiences.

Measures

Three measures were administered in October and then again in May: a standardized test of reading comprehension, a writing sample, and an interview tapping children's perceptions of reading and writing processes and strategies.

Comprehension. To eliminate the possibility of teaching to the test, neither the state-mandated test (ITBS) nor the district-mandated test (CTBS) was used. Instead, the comprehension portion of the Gates-MacGinitie Test was used. Appropriate levels were used for the three grade levels.

Writing. The writing samples were obtained through a district-developed writing assessment. All students in the same grade level wrote on the same topic for one class period. Trained evaluators scored the samples from 5 (high) to 1 (low) on each of seven primary traits (organization, sentence structure, usage, capitalization, punctuation, spelling, and format). In the district scoring system which was used for this analysis, traits were weighted differently within the total score. The total score summed the seven trait scores which had been multiplied by their individual rankings (with organization highest (7) and format lowest (1)).

Perceptions of reading and writing. A modified version of Burke's (1980) interview for reading and writing was used to examine students' perceptions of reading and writing processes and strategies. Responses to the question of "What is reading?" were placed into one of two categories. Answers that fell into the first category which received a score of 1 emphasized the skills of reading, such as "Reading is sounding out the words." Answers which were placed into the second category which received a score of 2 emphasized the meaning nature of reading, such as "Reading is a way of getting new information." The question that was used to assess reading strategies was "When you are reading and have trouble, what do you do?" Questions to assess writing processes and strategies were similar—"What is writing?" and "When you are writing and have a problem, what do you do?" Responses to the questions were also scored as either 1, a skill-oriented response, or 2, a meaning-based response. Students' responses included a number of ideas about reading and writing. The first view that children expressed for a particular question was analyzed.

RESULTS

The first step of the analyses was to use pretest scores to predict posttest scores on each of the measures. The residual scores from the regression procedure were standardized and subsequently used as the outcome measures in the analyses of variance. Residual scores used in these analyses are presented in Table 1. Standardized residuals, which have a mean of 0 and a standard deviation of 1, are expressed in standard deviation units above or below the mean, and can thus be easily compared across classes and treatments.

A similar design was used for the analysis of each measure. Class was entered as a factor in these analyses since a preliminary analysis of the standardized residuals indicated differences between classes within the same treatment on some measures and at some grade levels. The basic design, then, was an analysis of variance with treatment and grade as independent factors, and class embedded within treatment. Significant effects are summarized in Table 1.

On the comprehension measure, the students in literature-based classrooms outperformed those in skills-oriented classrooms. This pattern did not hold true within the

Table 1

Standardized Residuals for all Measures

	Literature-Based			Skills-Oriented		
Grade	2	4	6	2	4	6
n	42	44	45	42	46	40
Comprehension (Treatment)*						
	−.20**	.12	.37	.11	−.45	.09
	.35	.04	.22	−.35	−.36	−.03
Writing (Class within Treatment by Grade)						
	.27	.05	.48	.13	.02	−.24
	.64	−1.08	−.38	.07	.24	−.02
Reading Processes (Class within Treatment by Grade; Treatment)						
	.88	−.02	.60	−.71	−.66	−.60
	.54	.68	.69	−.73	−.18	−.61
Reading Strategies (Class within Treatment by Grade; Treatment; Grade)						
	.74	.02	.63	.24	−.57	−.46
	.75	.04	.44	−.66	−.79	−.38
Writing Processes (Treatment)						
	.75	.02	.64	−.25	−.47	−.66
	.52	.49	.58	−.49	−.76	−.51
Writing Strategies (Treatment; Grade)						
	1.20	.35	.69	−.51	−.74	−.49
	1.10	.18	.66	−.88	−1.00	−.72

*Significant effects are presented in parentheses. **Score of each class is presented separately.

entire literature-based treatment. Students in one second-grade class showed a slight decline. However, in comparison to the skills-oriented classrooms, the overall performance of students in the literature-based classrooms was somewhat higher on the comprehension portion of a standardized reading test.

This pattern of superior performances for literature-based students was not repeated on the writing measure. In this case, there were no differences between the two types of classrooms. There was, however, a significant class within treatment by grade interaction. An examination of the means for the standardized residuals on Table 1 suggests that the differences between literature-based classrooms at the fourth- and sixth-grade levels were substantial. In both cases, the difference was about one standard deviation.

Students' abilities to verbalize the processes and strategies of reading and writing will be discussed as a group. On all four measures, the results favored the literature-based students. Indeed, almost all standardized residuals for students in skills-oriented classes were negative, whereas those for literature-based students were consistently high and positive (with one exception). However, a negative standardized residual does not mean that students regressed in their perceptions of reading and writing processes and strategies. A negative residual can mean that, in comparison to others in the sample, students did not make as much progress from their initial achievement. For the students in the skills-oriented classes, there was a high degree of consistency in students' responses from the fall to the spring. In contrast, the perceptions of their peers in the literature-based program shifted to emphasize the meaningful nature of reading and writing.

DISCUSSION

The finding that the students in the literature-based classrooms scored somewhat better than their peers in skills-oriented classrooms on the standardized test of reading comprehension was unexpected. A proliferation of test-taking programs and attempts to align district and state curricula with test content and formats underscores a common assumption among educators that scoring high on tests results from practice on content and items that closely parallel the tests rather than from extensive reading and writing experiences. Perhaps, when test formats and items have not been practiced again and again, tests become more accurate indicators of some aspects of students' comprehension abilities, as they were intended. This result, of course, should not be overextended. Long-term data are needed to provide information on questions such as the nature of literature-based students' performances when they have not spent previous years in skills-oriented instruction as the children in this sample had.

Although the standardized test results were discussed first, it may be students' perceptions of reading and writing that matter in the long run. On this count, the differences in the literature-based and skills-oriented programs were striking. The students in the skills-oriented program maintained their concepts of reading and writing processes and strategies, whereas students in the literature-based classrooms moved from a view of reading and writing as skill-based to meaning-based. There were some differences by grade on the perception measures but, overall, these results suggest that children's views mirror the view of instruction. The relationship of these perceptions to students' futures as readers and writers is an important one for future research to consider.

Performances on the writing measure seem to contradict observations in these classrooms which showed considerably more time devoted to writing activities in the literature-based classrooms (Fisher et al., 1988). One explanation for this contradiction may lie in the evaluation criteria. The district scoring system emphasized the structure of passages and not fluency. However, even if fluency had been considered, there is reason to believe that the literature-based students might not have performed much better. The topic in the district program was imposed; selection of topic was foremost in the writing activities in the literature-based classrooms. As Scardamalia and Bereiter (1986) have noted, students write less when given the topic than when writing on their self-selected topics. This pattern might lead some to argue for self-selected topics in writing assessments. Still others will argue that students need to be able to express themselves well on topics that are not necessarily interesting to them. A possible solution might be to integrate both types of tasks on writing assessments.

These results need to be interpreted in light of the limitations of this study—and, indeed, the entire paradigm of comparisons of intact instructional practices. In particular, two caveats bear emphasis.

The first has to do with the novelty of the innovation for the literature-based teachers. Teachers in both groups were viewed as experienced and effective by school and district administrators. However, the instructional practices of the literature-based teachers had changed dramatically. At first glance, it might be hypothesized that teachers implementing a new approach could be at a disadvantage since they are implementing practices for the first time. A consistent finding in reading research, however, suggests the opposite. Innovations in reading instruction show superior effects over whatever is the conventional practice (Pflaum, Walberg, Karegianes, & Rasher, 1980). There are a variety of explanations for this phenomenon. For example, teachers implementing a new approach tend to spend more time in preparation. Also, the effects of teachers' beliefs that they are "doing the right thing" cannot be minimized. Furthermore, as Chall (1967) argued several decades ago, a critical question about the effectiveness of new programs concerns the sustaining nature of effects as the new practices become the conventional wisdom and as less experienced and dynamic teachers implement the practices.

The second caveat concerns the developmental and achievement levels of students. With only a few exceptions, even the youngest children in the sample had achieved an adequate level of fluency before participating in the literature-based program. In other words, this study provides no insight into the issues that Delpit (1986) has raised about the balance between "process" experiences such as self-selection in reading and the need for more directed experiences for beginning readers and writers, especially children who have had little prior school-like literacy experience.

No instructional program is a panacea. Some instructional practices, however, support children's learning better than others. This study indicates that greater participation by students in self-selection of literature and writing not only did not hinder students on standardized tests but, indeed, led to a slight edge over students in skills-oriented literacy instruction. In addition, the students in the literature-based classrooms experienced a dramatic shift in their views of literacy processes and strategies. Unfortunately, these data, only spanning a year, provide no insight into the impact of literature-based experiences in the long run. There is an urgent need for such research, if efforts to increase children's experiences in meaningful reading and writing tasks are to be sustained. The full impact of literacy programs based on a view of reading and writing as constructive processes will only be known when an extensive research literature has been amassed that includes attention to a variety of measures and to long-term patterns.

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A STUDY OF THE RELATIONSHIP BETWEEN INFLUENTIAL TEACHERS' PRIOR KNOWLEDGE AND BELIEFS AND TEACHING EFFECTIVENESS: DEVELOPING HIGHER ORDER THINKING IN CONTENT AREAS

Robert B. Ruddell and Pauline Harris
University of California, Berkeley

A renewed emphasis has been placed on study of the relationship between teaching effectiveness and higher order thinking during the past decade (Allington, 1980; Duffy, 1984; Durkin, 1978–1979; Ruddell & Sperling, 1988). Even so, our knowledge base leading to an understanding of this relationship remains restricted. This restricted base is due not only to the complex nature of the teaching-learning process, but also to the methodological approach which has attempted to isolate teaching behaviors independent of the teacher's prior knowledge and beliefs in the context of the classroom (Bloom, 1982; Duffy, 1982; Ruddell & Kern, 1986).

The purpose of this study was twofold: first, to provide insight into the relationship between influential teachers' prior knowledge and beliefs and their actual teaching performance in content areas; and second, to identify instructional strategies used by these teachers to develop higher order thinking. An *influential teacher* was defined as a teacher who has had a significant impact on the academic achievement of former students and has been identified by the former students and/or colleagues as an expert teacher.

The theoretical framework for the study is based on the Interactive Model of the Instructional Process (Ruddell & Kern, 1986; Ruddell & Speaker, 1985). This model accounts for four interacting elements in instruction. The model posits that effective teachers must design the *Instructional Environment* and the learning episode using conversational, instructional, and textual features. These instructional decisions, influenced by the teacher's *Prior Knowledge and Beliefs* (i.e., declarative knowledge, procedural knowledge, and values) are intended to actively engage the student's *Knowledge Control States*, (i.e., goal, plan, monitoring), tc stimulate the student's own Prior Knowledge and Beliefs, and so facilitate the active search for meaning. This search for meaning is monitored through the teacher's evaluation of students' responses, with provision for appropriate feedback and validation at various stages of the instructional episode, leading to the desired *Instructional Product* or learning outcome. During the first phase of this study (Ruddell & Kern, 1986), prior knowledge and shared beliefs among 18 distinguished teaching professors were identified. Key knowledge and beliefs shared by the teachers' included the perceived importance of: making material personally relevant to students; developing students' critical thinking; engaging students in the process of intellectual discovery; presenting material in a logical order, with clear statement of the problem, use of concrete, familiar examples, and extending thought to more abstract examples and concepts.

METHOD

The methodological approach used in this research was primarily descriptive. The data base consisted of influential teachers' responses to two self-rating scales and videorecordings of their performance in classrooms. This is the second phase in our research on these influential teachers. The first phase involved in-depth interviews with them to identify the influence of past individuals on their teaching ability, their philosophy of teaching, and factors they believed important to successful instruction (Ruddell & Kern, 1986).

Subjects

Subjects were 10 professors at a large West Coast university. These professors had been selected by a campus committee to receive the University's Distinguished Teaching Award based on recommendations from students and colleagues using criteria which included the following: command of subject matter; ability to clarify for students the relationship between the subject and other fields of study; enthusiasm and vitality in learning and teaching; ability to arouse intellectual curiosity in beginning students and to stimulate advanced students to creative work. These criteria embody many of the teaching effectiveness features of the influential teachers identified in our previous research (Ruddell & Haggard, 1982; Ruddell, 1983). Thirty-six professors had received this award over a 5-year period. Sixteen of these professors had been selected at random for the first phase of the study (Ruddell & Kern, 1986). Of this number, 10 professors were available on campus during the second phase and constitute the sample reported in this research. It was assumed that sabbatical leaves and leaves of absence would occur in a random fashion and thus maintain the integrity of the sample. The professors' content areas represented a wide range including Art History, Economics, Education, English, Journalism, Law, Physics, Political Science, and Rhetoric. Of the 10 professors, 8 were male and 2 female, with an average age of 48 years.

Procedure

The two self-rating scales, used in previous research, provided data on individual belief systems. The *Teaching Characteristics Scale* assessed professors' self-perception on five teaching characteristics. These characteristics, derived from student perceptions of their past influential teachers, had proved to be valid indicators of effective teaching in our past research (Ruddell & Haggard, 1982; Ruddell, 1983). These consisted of: (a) personal characteristics (i.e., sensitivity, openness, supportive attitude); (b) understanding learner potential (i.e., uniqueness of each student); (c) attitude toward subject (i.e., enthusiasm toward content); (d) life adjustment (i.e., sensitivity to student's academic and personal problems); and (e) quality of instruction (i.e., clarity of expectations, content of organization, effectiveness of presentation).

The *Classroom Interaction Patterns Scale*, based on an extensive research review (Ruddell & Haggard, 1982), examined self-perceived effectiveness in using classroom interaction patterns and consisted of five features, namely: (a) classroom communication system (i.e, ranging from closed and defensive to open and resolution seeking); (b) view of self in relation to students (i.e., ranging from inferior and weak to secure, strong sense of self); (c) class management style (i.e., ranging from use of authority and reprimand to cooperative action); (d) problem solution approach to learning (i.e., ranging from little curiosity and external motivation to high intellectual curiosity and internal motivation); and (e) teaching effectiveness (i.e., mean of the four factors rated).

Classroom performance data were collected by videotaping each professor. Each professor was asked to present the lecture or seminar as he or she would normally do in the natural context of the course. These classes ranged from 60 to 120 minutes with attendance ranging from a small group seminar of 6 students to a lecture of 470 students. The videotaping was initiated from the moment the professor entered the classroom and continued until any contact with students was terminated. Although this limited sample of teacher performance represents a limitation of the study, it provided the basis for an in-depth analysis of the 10 teachers to discern patterns in their use of instructional strategies to develop higher order thinking.

Two analyses were used for the videorecordings of the professors' teaching. The first used the *Teaching Characteristics* and *Classroom Interaction Patterns* rating scales to explore the relationship between prior knowledge and beliefs, and classroom performance. Each teaching performance was analyzed by two trained observers rating each professor's performance on teaching characteristics and on classroom interaction patterns. Reliability was at the .92 level for the *Teaching Characteristics Scale* and .95 for the *Classroom Interaction Patterns Scale*. The Spearman rho statistic (Isaac & Michael, 1981) measured the strength of relationship between the teachers' self-ratings and observed ratings for the summary variable in each scale (i.e., Quality of Instruction; Teaching Effectiveness). The second analysis consisted of a descriptive analysis of each professor's teaching to identify instructional strategies for developing higher order thinking. The major categories for analysis, found in Table 1, based on the *Knowledge Control* component of the Ruddell and Kern model of interactive teaching (1986), consist of goal (i.e., teaching objective, motivation), plan (i.e., instructional strategy, comprehension levels of thinking), and monitoring (i.e., discourse strategy in evidence). The content of these categories was inferred from the enacted data observed in the videotapes based on Erickson's microethnographic approach to the analysis of classroom teaching encounters (Erickson, 1982). Descriptors for comprehension levels of thinking were derived from the Ruddell taxonomy of comprehension/thinking levels (1978) and Rosenblatt's theory of literary transaction (1985). These levels are: factual (i.e., literal recall of information); interpretive (i.e., manipulation of information to develop new meaning); applicative (i.e., transfer of information and meaning to a new situation); and transactive (i.e., becoming one with the meaning of text or experience). Operationally, *higher order thinking skills* are defined in this study as mental processing operating at the interpretive, applicative, and transactive levels. This analysis was conducted by two trained observers and constituted the major descriptive aspect of the study.

RESULTS

Instructional Prior Knowledge and Beliefs, and Classroom Performance

The teachers' self-perceived view of Teaching Characteristics and Classroom Interaction Patterns and the observer-based rating performances are in Figures 1 and 2, respectively. These findings reveal not only high performance ratings but also a striking similarity between the teachers' knowledge and beliefs about teaching and their actual performance rating on the two scales. The observed performance ratings were slightly higher than the teachers' self-ratings on all teaching characteristics, except for personal characteristics, which was rated slightly higher by the teachers. Data in Figure 2 reveal a similar finding for classroom interaction patterns with observer ratings slightly exceeding self-ratings in all patterns, except for problem solution approach to learning. Statistically significant correlations were found for the key summary variable for each scale. Correlations for Quality of Instruction and Teaching Effectiveness were found to be .77 ($p<.05$) and .69 ($p<.05$), respectively.

These correlations suggest a strong relationship between the teachers' prior knowledge and beliefs, and their teaching performance. This finding is also supported from the first phase of the study (Ruddell & Kern, 1986). Those results, based on in-depth interviews, revealed that professors held a high level of confidence in their abilities as teachers and researchers. The interviews revealed not only a strong psychological

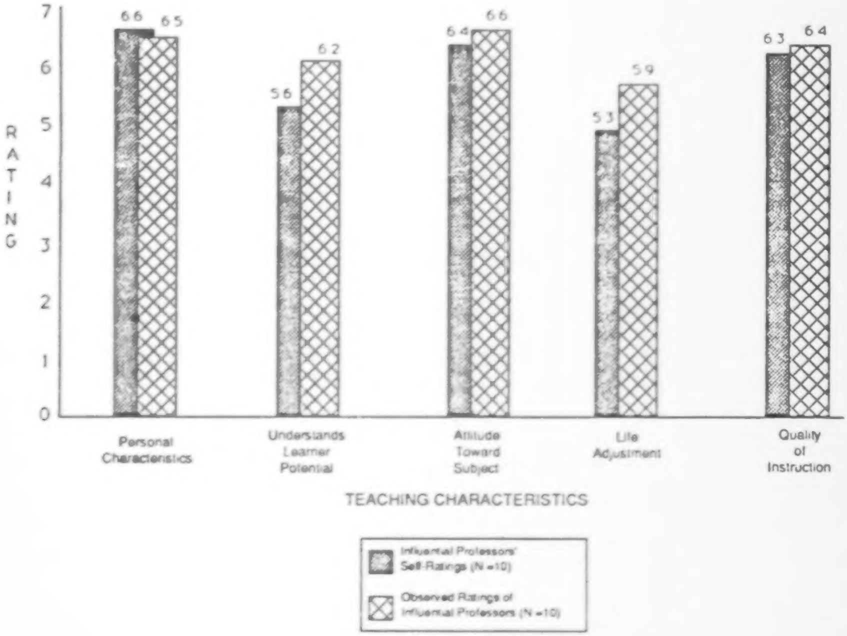

Figure 1. Professors' self-rating and observed rating of teaching characteristics.

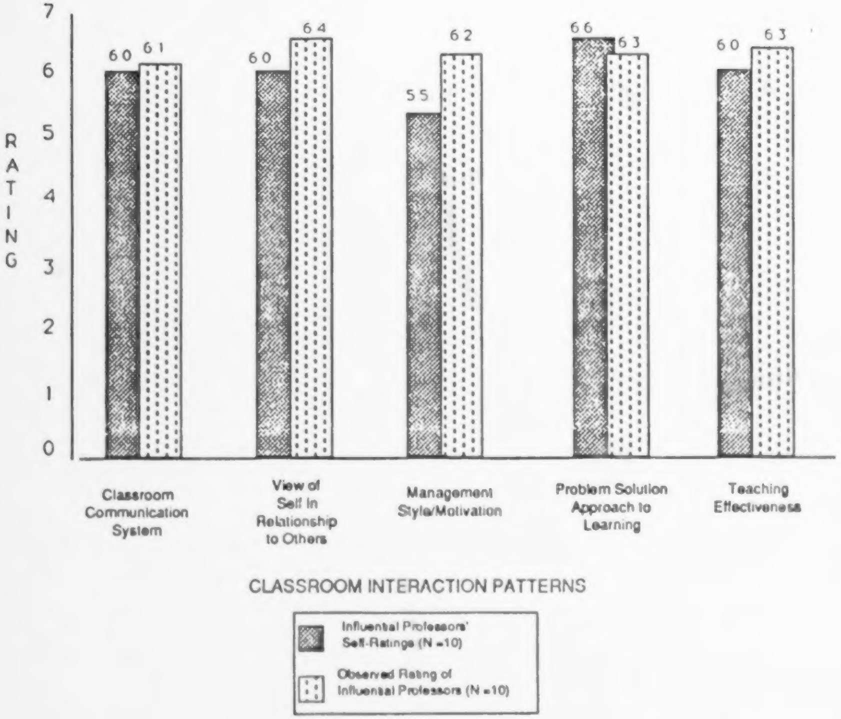

Figure 2. Professors' self-rating and observed rating of classroom interaction patterns.

support system provided by parents and family but also a strong influence of their past influential teachers on their teaching and belief systems.

Instructional Strategies and Higher Order Thinking

The rationale for the study provided the major categories for analysis which identified the goals, plans, and monitoring for each teaching sample. As the analysis proceeded it became evident that each teacher approached instruction in a given content area as a learner-centered problem-solving process to achieve higher order thinking. The problem-solving approach manifested itself across all teaching samples which ranged from large lectures to small seminar groups. Although the size and format of the groups influenced the degree to which the teacher engaged students in verbal interactions, nonetheless it became apparent that even in the absence of direct interactions, the teacher mentally engaged students in the process of intellectual discovery through raising questions and using examples that related to students' own experiences and understandings. In so doing, the teachers modeled, if not directly engaged students in the problem-solving process. From the enacted data three underlying instructional phases were inferred: *posing*, *exploring*, and *resolving* problems. These phases are illustrated in Table 1, with the example of Professor C's lecture. Each phase incorpo-

Table 1

Goals, Plans and Monitoring Strategies Used by an Influential Teacher, Professor "C", to Develop Higher-Order Thinking Skills

	Goal		Plan		Monitoring
	Teaching Objective	Motivation	Instructional Strategy	Comprehension Level	Discourse Strategies
1. Posing the Problem	to pose the problem of Orwell's real beliefs/motives	teacher expectation	introducing essay "To Shoot an Elephant"	factual: identifying general details and theme for discussion	lecturing: focusing—upon author/text extending—to Orwell's other writings
	to establish a shared historic context for essay (To Shoot an Elephant)	intellectual curiosity	explaining historical setting of essay relating essay to other essays by Orwell		
	to elicit/raise students' responses to the essay	teacher expectation	asking for student responses, with focus on text's memorability	applicative: valuing—making personal judgments	discussing: question/response focusing-on memorability raising-to applicative
2. Exploring the Problem	to explore the problem of Orwell's real beliefs through guided analysis of essay	teacher expectation intellectual curiosity	leading class discussion, with directed questioning	factual: identifying text details and main idea; identifying historical events;	questioning/responding: focusing-on text details; on Orwell's attitudes

to raise issues related to Orwell's beliefs (eg., Colonialism)	problem resolution	selecting, narrating, paraphrasing text samples from the essay	describing Orwell's experiences in Burma in 1922	re racism and colonialism
to validate, extend and raise students' responses		explaining historical background to each sample	interpretive: relating historical details and author's experiences to text	extending—relating text samples to historical events and author's experiences
to guide students in inferring meaning from text, identifying author's motives, making literary judgments of text	teacher expectation intellectual curiosity aesthetic problem resolution understanding self (mortality and the human experience)	directed questioning to analyze and evaluate text in light of: historical context (Burma in the 1920's); author's known beliefs and apparent beliefs in "T.S.A.E.," author's other writings (e.g., hanging scene in "Burmese Days") narration of text passages	interpretive: inferring author's motives and perspectives applicative: making literary judgments; evaluating how author conveys meaning (e.g., What is it that he doesn't say?) transactive: identifying with the man going to the gallows, and the human experience represented	questioning/responding: controlling—guided analysis of text with intent to determine Orwell's real meaning raising—from factual (known beliefs of Orwell) to interpretive (inferring his intent) raising—from interpretive to applicative (judging how Orwell conveys his intent) raising—to transactive

Table 1 (*Continued*)

	Goal		Plan		Monitoring
	Teaching Objective	Motivation	Instructional Strategy	Comprehension Level	Discourse Strategies
3. Resolving the Problem	to resolve the problem of Orwell's intended meaning in "T.S.A.E."	teacher expectation intellectual curiosity problem resolution	directing students through embedded problem-solving process: "Does the elephant symbolize the British Empire?" naming the problem; seeking, evidence; weighing evidence	applicative: problem solving	questioning/ responding: focusing—Is the elephant a symbol of the British Empire.? clarifying—e.g., Is that a pro or a con? extending—e.g., Any other possible meaning of the elephant? raising—drawing a conclusion from mixed evidence

Note: This lecture was English, attended by 175 undergraduate students.

rates goals, plans, and monitoring. These three components of the *Knowledge Control States* were implemented in a highly integrated and cohesive manner and will be discussed with particular reference to Professor C and followed by a more generalized reference to other teachers in the study.

Posing the problem. This phase commonly began with a clear statement of focus and provision of context that included historical, social and ideological setting, as well as links to previous lectures. Professor C, as described in Table 1, began his lecture by focusing upon Orwell's essay "To Shoot an Elephant." He did so by stating the focus of the lecture, and explaining its historical setting and the author's related experiences and beliefs. Within that context, he posed the problem of determining Orwell's real meaning in the essay, as opposed to what the author appeared to be saying. He raised students' responses from the factual to the applicative level, making judgments about text and author.

Other teachers in this study also presented their topics as problems. In a Political Science lecture, Professor J posed the problem of how true independence is achieved, embedded in three historical examples. In a Journalism seminar, the question of the author's real voice in Tom Wolfe's book, *The Right Stuff*, was posed.

Problems in other teaching samples included the awarding of damages in two law lectures; students' own research problems under current investigation in a Physics seminar; and the implementation of the clinical procedure in a teacher education class. Common to the 10 observed lessons was the contextualization of the problem in its social, historical, and/or ideological setting. This contextualization shows evidence of the teachers' implementation of their shared belief that, to understand the real meaning of an event, concept, or idea, it is critical to understand the context from which it arose (Ruddell & Kern, 1986). Subsequent exploration of events and concepts was then initiated.

Exploring the problem. This process unfolded in various ways across the 10 teaching samples. It generally began with the factual understanding of concrete examples to illustrate the problem and form the basis for extending and raising understanding. As shown in Table 1, Professor C guided students in an evaluative analysis of Orwell's essay, to explore the author's real perspective. Professor C guided the students through directed questioning embedded in text samples that were narrated and paraphrased. With each text sample, the problem was restated and questions focused on the factual content of the passages. Factual understanding was then extended through linking passages to Orwell's other writings and related experiences, and the historical setting of the essay. With students' understanding thus extended, Professor C then began to raise the discussion to interpretive, applicative, and transactive levels.

Across all teaching samples, exploration of the problem involved extending students' thinking within one level to consider varied aspects of a particular issue. This extension was followed by raising thinking to higher levels, most commonly the interpretive and applicative levels. For example, Professor J, in Political Science, considered the issue of how true independence is achieved through exploring three different paths to independence, each with a specific historical setting. In Law, Professor S persistently explored the problem of awarding damages through discussion of case histories and hypothetical examples that engaged students in exploring multiple facets of the one issue. The raising of students' thinking to higher levels did not always involve a simple progression from the factual to the interpretive, applicative, and transactive levels. There was intricate interplay among the four levels of thinking, with frequent returns to the factual to substantiate responses, raise issues for further exploration, and highlight many facets of the one problem. This finding is consistent with two shared beliefs of the teachers identified in the first phase of this study: that problems need to be embedded in meaningful examples, and that it is important to present students with multiple perspectives of a problem to develop higher order thinking (Ruddell & Kern, 1986).

Resolving the problem. On completing the exploration of a problem, resolution was initiated. This initiation usually involved summarization, and often gave rise to issues for discussion in subsequent lectures. Professor C, as shown in Table 1, began working toward resolution of Orwell's real perspectives by raising a miniproblem that was embedded in the larger problem under consideration. This miniproblem concerned the symbolic meaning of the elephant. Students were guided in seeking evidence from the text, and placing that evidence on either the "pro" or "con" side of the problem. Evidence was then assessed and a conclusion reached. The resolution of this embedded problem was then used to explore Orwell's own perspectives of the British Empire in his essay.

Problem resolution was also found in the other samples. In Political Science, as each path to independence from a colonial power was explored, some conclusions were reached. These conclusions were brought together at the end of the lecture with the clearly reiterated statement that the substantive nature of independence depends on the process whereby independence is achieved. In some case, resolution was not reached but a plan for later resolution was formed. For example, in the Law class on contracts, Professor S still had not reached satisfactory resolution of the problem at the end of the lecture, and asked the students to consider the problem further for the following class. Inherent in the resolution phase across all the teaching samples was a persistence and high teacher expectation that resolution of a kind would be reached.

These three instructional phases of *posing*, *exploring*, and *resolving* problems were evident throughout the teaching samples. These phases were not necessarily implemented in a simple three stage progression, however, but often in more complex patterns. Features such as contextualization of meaning, the development of multiple perspectives, and development of events, concepts, and ideas in a manner which activated student background knowledge were common across our observations.

These influential teachers consistently orchestrated the extending of students' thinking within one comprehension level, and raising thinking processes to higher levels, through lecturing, question/response sequences, and discussion. These interactions were the means whereby the teachers activated students' prior knowledge and beliefs and created a bridge between student and content. The raising of students' thinking involved intricate interplay among the four levels of thinking, with frequent returns to the factual to substantiate responses, raise issues for further exploration, and highlight many facets of a problem. Thus factual questions provided the foundation for transporting students to higher levels of thinking.

DISCUSSION

The results of the study provide several important clues to understanding effective teaching and offer suggestions for future research. First, the findings suggest a significant and positive relationship between the prior knowledge and belief system held by influential teachers and their teaching effectiveness. Coupling these findings with the earlier phase of the study (Ruddell & Kern, 1986), it seems clear that their own influential teachers had a significant impact on their knowledge and belief system about teaching. This factor should be pursued in future research that examines the impact of an influential role model on teaching effectiveness at both the preservice and inservice levels of teaching. Such research should examine which features on the *Teaching Characteristics* and *Classroom Interaction Patterns* scales are amenable to change by role models and instruction and which are relatively fixed with little potential for change.

Second, the teachers were found to share the belief that effective teaching is achieved through guiding students through a critical intellectual discovery process. This belief was manifested in their strategies of *posing*, *exploring*, and *resolving* problems which were embedded in meaningful contexts. The three phases of the process were enacted through lecturing as well as question/response and discussion interactions. The sequences, at times, superficially resembled the initiation-response-evaluation model commonly found in classrooms (Mehan, 1979). However, there were important differences between the Mehan model and our observations in these classrooms. Although the questions posed in the I-R-E model are typically known-information questions, the questions posed in our teaching samples required careful exploration of a problem rather than the display of an accurate answer. Teachers' responses to students were generative, in that they clarified understanding, validated students' responses, raised further issues, and used students' responses as data for further exploration. Implicit in this, too, was the teachers' apparent monitoring of students' thinking, made explicit through verbal feedback, and the asking of subsequent questions. These findings and conclusions differ markedly from those recently reported on secondary and college teaching that note minimal student-teacher interaction and little or no emphasis on higher order thinking (Goodlad, 1983; Karp, 1985). Our research, however, focused on influential teachers who were identified on the basis of their teaching effectiveness. By contrast, this study developed an in-depth qualitative analysis of effective instructional strategies used by these influential teachers rather than a quantitative survey of more global teaching behavior.

Third, although factual questions were asked across all teaching samples, they were used to provide the foundation for developing higher order thinking. These factual questions were interwoven among higher-order questions. This finding contrasts with Heath's finding (1982) that literal questions are asked first, before higher order questions are asked, if at all, in school. Such a linear sequence is questionable and while the findings of our study come from the university classroom, the relevance of these findings to elementary and secondary classrooms deserve consideration. A suggestion for future research is to explore influential teachers', as well as other teachers', prior knowledge and belief systems as related to teaching practices in grades K–12. This should involve the careful examination of how teachers initiate questions, give responses, and negotiate meaning in a way that develops higher order thinking. Documentation of student perspectives would also lend insight into how their thinking has developed.

In conclusion, our findings from the study of influential teachers exhibit a close parallel to the writing of Sylvia Ashton-Warner (1963), who states, "I reach a hand into the mind of the child, bring out a handful of the stuff I find there, and use that as our first working material." Although developed in a different context, our findings support the belief that successful teaching is an active, collaborative, learner-centered process of discovery.

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A LITERACY EDUCATION MODEL FOR PRESERVICE TEACHERS: TRANSLATING OBSERVATION AND REFLECTION INTO EXEMPLARY PRACTICE[1]

Virginia G. Allen
Ohio State University at Marion

Evelyn B. Freeman
Ohio State University at Newark

Barbara A. Lehman
Ohio State University at Mansfield

One challenge facing teacher education today is to provide links between theory and practice so that preservice teachers are able to interact with teachers who implement the theory and research being espoused in teacher education courses. Another aspect of this issue is the need for collaboration between university faculty and the classroom teacher in the preparation of elementary teachers. Connecting theory and practice is especially critical in the elementary language arts where new insights about language and literacy have burgeoned in the past two decades (e.g., see Applebee, 1978; Clay, 1975; Graves, 1983; Huck, 1977; Moffett, 1968).

This paper explicates a model of literacy education for preservice teachers designed to create links between theory and practice and to develop a strong partnership between university and school in preparing elementary teachers. The model further emphasizes the role of observation and reflection through the use of videotapes in facilitating exemplary teaching practice.

Our literacy education model draws from several areas of research dealing with teacher education and the role of the classroom teacher, particularly those investigations which have examined the importance of the teacher as a decision-maker. Heck and Williams (1984) discuss the significance of this role for the teacher who daily must make important decisons regarding children, curriculum, instruction, and evaluation. They suggest that videotapes of actual classrooms provide information for practice in developing skills of decision-making. In addition, the use of reflection—assisting preservice teachers to think about their perceptions and teaching behaviors—has been advocated by many researchers (e.g., Berliner, 1984; Cruickshank, 1985). The Ohio Reading Recovery program includes a staff development model in which teachers observe a teacher and child working together behind a one-way glass. Through the guidance of a teacher leader, teachers are able to "develop their own knowledge through observation and talk" (Pinnell, 1987, p. 6). Jaggar (1985) describes how observation of children can play a critical role in teaching as a link between theory and practice. A recent theme issue of *Language Arts* (November, 1988) titled "The Reflective Practitioner" includes many articles which stress the value of reflection in the teaching process.

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[1] With thanks to Linda Aufdencamp and Jacqueline Mitchell, Marion City Schools.

In response to these concerns, we developed six videotaped literacy protocols for undergraduate courses in children's literature, reading, and language arts methods. The value of such tapes is in enabling preservice and inservice teachers not only to observe a class together but to slow down the rapidly occurring events in a classroom to focus on specific incidents. Bracey (1987), in reviewing studies on reflective teaching, found that when analyzing videotapes of classroom incidents, most teachers begin by making evaluative judgments about classroom practice rather than describing what is occurring. However, he points to findings that indicate when teachers acquire observational skills, they have a strong base for reflection when given sufficient opportunity to practice those skills.

As preservice and inservice teachers talk together, they develop a shared language for description and reflection. The power of shared reflection has been commented on by Strickland (1988): "Teachers learn in many ways. They learn by reading, by observing in their own classrooms and in the classrooms of others, by reflecting on their observations along and with others, and by sharing their knowledge and experience" (p. 759).

The development of the literacy protocols was a collaborative effort of university faculty and inservice teachers. Together we decided what kinds of concrete examples of children and teachers working in natural classroom settings would be most valuable. We identified six significant themes in the area of literacy: (a)"Using Big Books with Children" (rationale, uses, and selection); (b)"Collaboration in Writing" (shared writing, peer editing, and author's chair experiences); (c) "Young Writers: The Road to Independence" (strategies to support young children as they compose); (d) "Book Discussions" (teacher-led and student-led); (e) "Purposeful Reading Aloud by Children" (choral reading, readers' theater, and reading for their own purposes to adults and other children); and (f) "Reading Aloud and Storytelling by Teachers" (techniques demonstrated).

Classroom teachers and university instructors worked on the development of the tapes. We shared the objectives of segments of our university courses. The teachers talked about ways in which their instructional practices meshed with our focuses. They chose a day when we might visit and videotape the work in their classrooms. During the taping the university instructor did not shape the instruction or the interactions in any way, nor participate.

In the editing process, the university instructors identified significant incidents. After rough cuts were made, the teachers viewed the tapes. Often they were able to further explicate or give important background information that assisted us in the final preparation of the tapes and study guides.

Each of the six tapes is accompanied by a study guide which includes a rationale, a description of the taped episode, questions for discussion, and related references. Viewing the tapes provides a common experience for teacher educators, cooperating teachers, and preservice education students—one that becomes a catalyst for observation, discussion, and reflection.

LITERACY EDUCATION MODEL

Our proposed literacy education model for preservice teachers is designed explicitly to erase the artificial dichotomy between theory and practice. It is based on a belief that both teacher educators and elementary teachers must become more "reflective practitioners" (Dillon, 1988). We need to understand what our theories are and to practice what we preach. This is a two-way street. Teacher educators and elementary teachers can learn from each other as we join the ranks of "reflective practitioners in our own classrooms, searching for insights that will help us understand and improve our practice" (Bissex, 1988, p. 775). Collaboration (such as that needed to create videotapes of real classroom practices) can enhance the ties between university and elementary school teaching and allow the lessons and understandings of practice to refine and strengthen theory. We each need what the other party can offer.

At the same time, if those of us who work with preservice teachers can bridge the gap between university and field setting, we will help them to gain a more holistic view of teaching children. Too often, the traditional university (theory)/elementary school (practice) split has caused undergraduate education students to develop schizophrenic professional personalities (see Figure 1). What they hear in university classes has not been seen in elementary classrooms (or, for that matter, in education classes either). Often, what professors tell them they should do, cooperating teachers inform them will not work. Thus, preservice teachers create dual language systems and sets of beliefs, understandings and strategies/processes for their own teaching roles and the roles of children—an overt set that they espouse in methods classes and a more covert set that they practice in field experiences and later in their own classrooms. Preservice teachers may feel (somewhat justifiably) that "ivory tower" university professors simply are not as credible as "real world" elementary teachers. With the help of videotaped

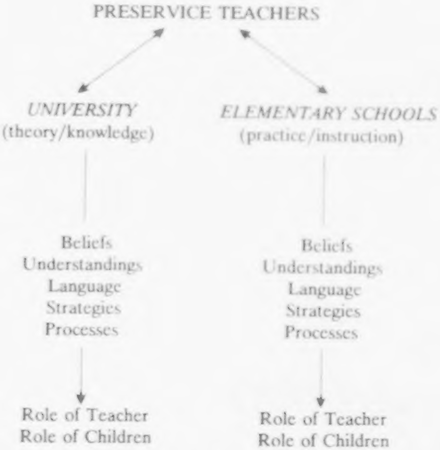
PRESERVICE TEACHERS
UNIVERSITY
(theory/knowledge)
ELEMENTARY SCHOOLS
(practice/instruction)
Beliefs
Understandings
Language
Strategies
Processes
Beliefs
Understandings
Language
Strategies
Processes
Role of Teacher
Role of Children
Role of Teacher
Role of Children

Figure 1. Theory-Practice Dichotomy.

protocols, this duality can be fused into a more integrated professional stance (see Figure 2). Specifically, the purpose of these literacy protocols is to enable preservice teachers to translate observation and reflection into exemplary practice.

First, university teacher educators and elementary school teachers can collaborate in creating the videotapes of exemplary (but "real world") teaching practices, which form a bridge between theory/knowledge and practice/instruction. In this process, both partners can become more reflective practitioners and offer a more unified perspective for preservice teachers, with whom they both interact. Second, videotapes also can serve as a lens through which preservice teachers observe and reflect on the roles of teachers and children in elementary school literacy settings. For all parties, videotapes can become a medium through which to forge a common language and set of beliefs, understandings, and strategies/processes. All would benefit from each other, with the identical goal of becoming better teachers and learners.

PILOTING THE MODEL

We explored the viability of this model in preservice teacher education by piloting one of the tapes, "Collaboration in Writing." This protocol is divided into two parts: (a) collaboration in building a text and (b) collaboration in revising texts. The first part shows two classes engaged in shared writing experiences (McKenzie, 1986). With the help of their teachers, a fourth-grade group develops a class story about a shrinking adventure, and a kindergarten class refines its story about a trip to the moon. The second part depicts a third grade working at various stages of the authoring cycle (Harste & Short, 1988), with particular attention to the peer editing portion of that

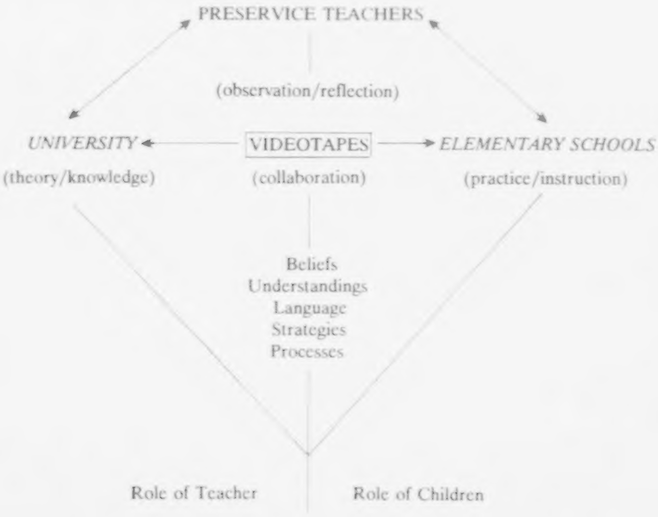
PRESERVICE TEACHERS
(observation/reflection)
UNIVERSITY
(theory/knowledge)
VIDEOTAPES
(collaboration)
ELEMENTARY SCHOOLS
(practice/instruction)
Beliefs
Understandings
Language
Strategies
Processes
Role of Teacher
Role of Children

Figure 2. Unified Literacy Education Model.

sequence, and illustrates a second grade participating in an author's chair experience (Graves & Hansen, 1983).

This tape was shared with a group of 27 undergraduate students enrolled in the Language Arts Methods class of one of the researchers. A kindergarten teacher and a fifth-grade teacher, both of whom had a strong interest in writing and who had often served as cooperating teachers, were invited to view the tape with the education students and to lead a discussion following the viewing. We sought to discover if the tape would provide a strong context enabling preservice and cooperating teachers to examine together some specific aspects of the writing process. The university instructor was an observer of and not a participant in the discussion. Both teachers were given the study guide to assist them in focusing the discussion. In addition these teachers also created displays of their own children's writing that they shared with the undergraduates.

The researcher introduced the tape and told students and teachers that immediately following the protocol they would be given 5 minutes to respond to the following question: What was the value of watching this tape for you? As soon as all had written their responses, the teachers began the discussion using the study guide questions as a springboard. The discussion lasted for 45 minutes and moved beyond the scope set forth in the study guide. As the conclusion of this exchange, all the participants were asked to respond to the question: What did this discussion do to clarify your ideas about the teaching of writing? Next, the teachers explicated the displays of children's writing, using them as a basis for talking about process and developmental stages of writing.

Insights from Viewing the Tape

An analysis of the written responses made by the undergraduate students after viewing the videotape provided pilot data on the viability of the model.

The analysis revealed four trends. This showing of the pilot videotape illuminated in a new light what the students had been learning in their methods classes. Although they had read and discussed developing writing with children, many of the students had concerns about how it would work in the real world of the classroom. One student wrote, "I realize now that there actually are teachers out there trying to integrate the program and that it can be done." Another student commented, "This tape shows how valuable working together can be . . . I knew it could be done, but never had seen it in practice." Other students wrote that "viewing the actual process on tape gave me a better understanding of how to go about implementing shared writing in a classroom," and "the value of the tape was that it put collaborative writing into context." Further, certain verbs were used consistently by students to support the value of the tape in linking theory and practice: "illustrated," "showed," "served as a model."

Secondly, the videotape became a lens through which preservice teachers could observe and reflect on the roles of teachers and children in literacy learning. For example, one student wrote: "Throughout the video, I made two lists. There were lists of what the teacher did and what the students did. The list for the teacher was very short! The student list of participation was lengthy. This shows to me the importance of teachers setting a framework for students to accomplish their writing." Various aspects of the teacher's role were mentioned, and one important theme centered on how teachers permitted children to keep ownership of their writing. For example, a student wrote, "Watching the group writing process was helpful. (We saw) how the teachers led it, but left it to the students. She didn't 'control' the story." Students also commented on the facilitating role of the teacher: ". . . the teacher (was) a guide in the process." "When the teacher writes, the children can brainstorm and negotiate." Another important role of the teacher dealt with planning and management. One student wrote, "I was reminded that exciting lessons and activities do not develop themselves. Important foundational experiences must be available to students before they can do more complicated activities." Another student reflected, "The teacher is in charge of how much will go on . . . . The teacher needs to be flexible and see what needs are being met."

In addition, the students gained insight about children. Children's ideas seemed to take on a greater importance. One student wrote, "You really can use children's ideas." Another commented, "[The tape showed] the importance of children sharing ideas with each other. They learned from each other." The value of collaboration for children also was noted. "It showed me how a group of children can work on a shared piece of writing and obtain a consensus about what the story line should say. Accommodating various perspectives and ideas helped improve the quality of the finished product and probably improved the individual writing style of each child to a degree." Developmental differences among children were also observed, as evidenced in this written comment, "I also thought it was valuable to show the grade differences when doing this project. Every grade is different and this tape showed us how to adjust to the different aged students."

Finally, the videotape clarified students' ideas about how to support the writing process. "It showed how the concrete experience, when used as a base, helps children to begin a story, as they moved from the known to the unknown. The group helped stimulate ideas." Students also gained knowledge regarding the various stages in the writing process: "Before the teacher ever saw the work, the students had a chance for feedback, revision, and refinement."

Insights from Discussion of the Tape

The university observer found the teacher-led discussion following the viewing of the tape to be animated and lively. Although teachers began the discussion using the study guide questions, it was the questions students asked of the classroom teachers that really drove the talk. The observer noted that many students' questions were ones that they had raised earlier in her class: What about giving grades? Isn't collaborative writing very time consuming? What will the principal say? How do you meet all the objectives in the course of study? However, it was only when the classroom teachers responded that the students began to articulate the belief that certain instructional practices were not only sound, but were indeed possible. As one student commented, "The discussion clarified any doubts I had about using the ideas seen on the tape. I saw that it was going on in classrooms, and that it wasn't just fantasy land."

The teachers, however, did more than simply respond to students' queries. They helped them reexamine taped segments from different perspectives. Written reflections showed students had viewed the tape focusing heavily on discovering just what it was that teachers did: how they organized an activity, how they managed the group, how they interacted, how they adjusted for different age groups. Teachers' comments prompted students to think about children: "Did you see how the little girl who was so quiet in the beginning, really became much more active later on?" "How interested the children were in listening to each others stories!" "I was really interested in seeing the story vocabulary those kindergarten children were using." The teachers also pushed the students to explore the "whys" of actions of the teachers in the tape: "What do you think the teacher had in mind when she asked him that question?" "Those two teachers were very different in the way they conferenced with children, weren't they?" "I wonder if the teacher had a reason for calling on that particular child for an oral reading experience?"

The talk following the viewing had a strong impact on the students. Over and over the students commented that talking with real teachers was important: "The discussion pointed out practical implications for teachers in the 'real world'." "I like seeing teachers that REALLY do this. They shared their personal opinions based on REAL experience." "Listening to these two teachers talk about their experiences makes me feel that yes, this can be done." "The discussion provided realistic feedback about what kinds of things we can expect to have happen in our classroom on average days." The observer commented that only 2 weeks earlier, she had shared a tape made of her own work with children in a classroom over a 3-year period. She was somewhat distressed to discover that she was not viewed as a real teacher, nor were the children she worked with viewed as real children!

CONCLUSION

The videotape served as a bridge between theory and practice. It provided a common experience through which all participants could become more reflective practioners. It slowed down the fast-moving interactions that go on in classrooms allowing viewers to look again, to question, to speculate, and to extend what they had seen together. For the students the opportunity to talk with teachers validated all they had been learning in their methods classes. As one student said, "My thinking of what a teacher wants to do and what a teacher needs and has to do are becoming almost the same thing."

For the classroom teachers, the videotape created an opportunity to make their implicit theories and practices explicit as they discussed the tape with undergraduate students and to use their knowledge to clarify theory. In addition, the teachers gained a better understanding of education students who will be coming into their classrooms as student teachers. In their reflections, written after viewing the videotape, one teacher wrote, "Freeing children from spelling and punctuation worries appeared to bother some of the students, but I feel ideas flow freer without the worry of punctuation." The other teacher commented, "They (undergraduate students) are really grappling with the important questioning issues one would hope they would be addressing near the end of their training. I sensed an understanding of the elements of the writing process and a desire to be process teachers."

Our initial explorations with this model led us to believe it can provide a valuable framework for teacher education as it integrates theory with practice and the university with the schools. However, systematic research needs to be conducted to determine: (a) how videotapes as instructional tools support the development of undergraduate students' abilities to reflect on their knowledge about the writing process, their observations of young writers, and their use of instructional strategies; and (b) how videotapes serve as a vehicle for students and cooperating teachers to share understandings about the writing process, ways to observe young writers, and exemplary instructional strategies.

Although videotapes of naturally occurring classroom practice form the core of this model, viewing the tapes by themselves is not sufficient. This was demonstrated clearly in the responses gathered when we piloted this first tape. The videotapes, however, served as a catalyst for observation and reflection. Further, teacher education is a partnership between preservice teachers, teacher educators, and classroom teachers. The value of reflection is even more profound when all members of the partnership reflect together.

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ADOPTION OF THEORETICALLY LINKED VOCABULARY-READING COMPREHENSION PRACTICES[1]

Patricia L. Anders and Margaret A. Gallego
University of Arizona

A theme receiving considerable attention among literacy researchers is teacher's use of research-based instructional practices. Ruddell and Sperling (1988) remind us that "in spite of a rich and growing store of research knowledge related to the processes of reading and writing, we must seriously question the impact that such knowledge has on teaching" (p. 319). Many researchers grappling with this problem have framed it as a question of understanding the relationship between teachers' beliefs, empirical knowledge, and teachers' practices (Fenstermacher, 1987; Hoffman & Kugle, 1982). Harste (1986) contends that although much might be understood about the theoretical explanations of the reading process, little is known about how that knowledge is actualized in the classroom. Hopefully, the results of the present study will contribute to a better understanding of that process.

This study grew out of the second year of a 3-year investigation to answer the question: What is the effect of particular theoretically derived vocabulary instructional practices on upper elementary bilingual learning disabled student's reading comprehension of content area text? Practices were developed to reflect the interactive characteristics of the knowledge hypothesis (Anderson & Freebody, 1981; Mezynski, 1983). The practices involve the teacher and students in using conceptual vocabulary from a content area reading passage to construct and complete a graphic organizer prior to reading.

Specifically, we used three types of graphic organizers. One was a semantic map. The words for the map were selected on the basis of a content analysis of the text and, through discussion, students and teacher created a map displaying the relationships between terms prior to reading. After reading, the map was discussed and changed to conform with information learned from the text. The second graphic organizer was a semantic feature analysis (SFA). This is a matrix chart that organizes the terms derived from the content analysis into column headings that represent categorical knowledge or line headings that represent detail knowledge. A third interactive practice was identified as a semantic syntactic feature analysis. This practice is the same as the SFA with the addition of five cloze-type sentences. The deletions are of a word from the categorical level and a word from the detail level. Following reading, the teacher and students review the graphic organizer and make accommodations to account for the information provided by the author. This overall question was addressed in the first year by researchers teaching the instructional practices in content area classrooms. During the second year teachers were invited to participate in a staff development program designed to teach them to use the practices. These trained teachers taught the experimental instruction and collected the dependent measures. Our questions for Year 2 were: (a) Will the staff development program adequately teach classroom teachers to use these practices? and (b) Will the practices be effective when used by classroom teachers? The answer to the former is the focus of this paper; the answer to the latter is presented elsewhere (Bos, Allen, & Scanlon, 1989).

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Initially, the question seemed straightforward. We planned to simply videotape the teachers as they practiced using the interventions and when competencies had been achieved, they would use the experimental materials and conduct their assigned instruction. However, both the literature and our experience informed us that the issue at hand was far more interesting and complicated. We wondered, what do these teachers believe about teaching vocabulary and reading comprehension with subject materials? When they talk about teaching reading, what types of language do they use? Does that language reflect what they do in the classroom? To address these questions we drew upon three data sources: (a) a paper-and-pencil survey given the teachers after the staff development to ascertain their recognition of the practices and their evaluation of the effectiveness and usability of theoretically linked vocabulary practices; (b) a structured interview conducted at the end of the training to measure their reflective ability to talk about the quality of the practices used in the study and on their knowledge of reading comprehension practices; and (c) video- and audiotapes of the teachers using the practices in their classroom to provide a means to analyze the extent and quality of interactive instruction. These three data sources provided information that we examined in two ways. First, we summarized the responses from all the teachers for each of the three data sources. Second, we triangulated these sources to create a composite of each teacher.

METHOD

Participants

Seven teachers of elementary bilingual students identified as learning disabled participated in the staff development, filled out the survey, conducted the interactive practices instruction, and completed the interview. All but one of the teachers were female and ranged in experience from 2 to 22 years, with an overall average years of experience of 11.2. Two of these teachers had earned a bachelor's degree, 4 a masters' degree and 1 an educational specialist degree. They were all certified special education teachers. In addition, 1 had reading certification and 2 had bilingual/ESL endorsements. During the first year, the teachers observed us teaching the practices and volunteered to participate in the staff development and data collection during the second year of the study.

Materials and Procedures

Staff development. The staff development program consisted of 2 days of instruction a month apart, videotapes of teachers doing the practice instruction with researcher support during the practice sessions, and teaching and testing materials prepared by the research staff to accompany content area text passages.

The materials provided during the staff development consisted of a notebook with script-like guidelines developed for each of the practices, student handouts for use during the instruction, copies of the text to be read and copies of the various dependent measures to be collected from the students. Each teacher received two sets of materials for practice in the classroom and one set of materials for the experiment.

Each of the staff development day's activities were designed to parallel the components of the interactive practices implied by the knowledge hypothesis (Bos & Anders, in press). Those components include (a) providing an overview and directions, (b) activating students' prior knowledge, (c) tying new knowledge to old knowledge, (d) providing opportunities to predict relationships, (e) using cooperative knowledge sharing, (f) teaching conceptual vocabulary in relation to the content to be read, (g) providing opportunities for students to justify relationships between and among concepts, and (h) encouraging students to confirm their undertstandings.

During the month between the 2 staff development days, the teachers conducted practice sessions with their classes. A university researcher videotaped at least one session and was available at other times to answer questions and provide additional information. Segments of the videotapes were chosen to represent each of the eight instructional components and were used as model instruction during the second day of staff development.

Data sources. Each class was video- and audiotaped during the experimental condition. The tapes were transcribed and teacher utterances were categorized and coded according to the eight instructional components implied by the knowledge hypothesis. Four Spanish-English bilingual graduate assistants were trained to code the utterances. An interscorer reliability of .83 was established at the initial training session. During coding, reliability was established at .87 and .92 based on two transcripts. The proportion of utterances categorized in each of the components was tabulated to illustrate the degree to which teachers adopted the interactive vocabulary-reading comprehension practices. For the composite of teacher's adoption of the practice these proportions were grouped into "high," "medium," and "low."

The second source of data was a survey completed by each teacher at the conclusion of the project. The survey (Miller, 1987) was designed to ascertain the relationship between teachers' evaluations of the effectiveness and the usability of empirically based vocabulary strategies and observable practices. Miller identified these practices from the literature and categorized them according to three hypotheses for explaining the vocabulary-reading comprehension connection: the knowledge, instrumental, and the access hypotheses (Anderson & Freebody, 1981). Four practices were derived for each hypothesis and a short description of each practice was provided and teachers judged first the degree to which each of the practices was effective and second the degree to which each was usable in the classroom using a 5-point Likert Scale.

In the present study teacher's judgments of the four knowledge hypothesis related practices, the four instrumental hypothesis practices, and the four access hypothesis practices were summed and an average rating across the practices was computed. Corresponding with the Likert foils, an average rating of 4 or more was considered high, a rating of 3 was considered neither high nor low, and a rating of 2 or less was considered low. This scale was triangulated with the results from the video and interview analyses for each teacher's composite.

The third source of information was collected from the teachers during a structured interview designed to ascertain each teacher's language about the practices employed in the project. The interview consisted of three parts: First, we asked background information concerning previously used vocabulary and reading comprehension practices; second, each teacher was asked to evaluate how well the interactive practices helped students understand and remember what they read, and to report the strengths and weaknesses of each practice used; and third, we asked how the practices might be generalized for nonexperimental use by teachers and students.

These interviews were audiotaped and transcribed. They were analyzed by reading each transcription and generating a list of empirical premises about the teaching of vocabulary and reading comprehension. An empirical premise is an observable and testable explanation of a phenomena, for example, "The chart made students pull their prior experiences into their reading . . . ." The proportion of empirical statements reflecting a knowledge hypothesis was computed. For the composite, those teachers with 35% or more of their empirical statements related to the knowledge hypothesis were rated as "high," those with 20% but less than 35% were rated "medium," and those with less than 20% were rated as "low."

These three data sources—the videotapes, the surveys, and the interviews—were analyzed and summarized. In addition, a composite of each teacher's survey, video, and interview was constructed.

RESULTS AND DISCUSSION

Teachers' Use of Practices

Teacher's use of the practices was indicated by their verbal behavior during the experimental session in their classroom. The transcribed videotapes were analyzed for utterances and those utterances associated with the knowledge hypothesis were tabulated. A broad range was recorded, 48% to 75% of the utterances spoken by the teachers corresponded with the components of interactive teaching. More than half the utterances coded for 6 of the 7 teachers reflected components of interactive teaching, and slightly less than half of the utterances were interactive for the remaining teacher.

At this very general level, it is apparent that the teachers had learned to use the practices. Two features of the staff development that may have contributed to its impact included the design of the program and the materials provided. The intensive training during 2 days of staff development provided opportunities for teachers to model the strategies with each other. These simulations aided teachers in becoming comfortable with the strategies before using them with their students. Second, materials provided the teachers included a script to guide instruction. These scripts were developed to incorporate interactive components based on the knowledge hypothesis. Thus, teachers had reference materials readily available.

Teachers' Evaluation of Practices

On the survey, teachers evaluated the knowledge hypothesis practices higher than either the access hypothesis practices or the instrumental hypothesis practices. The average evaluative judgment scores across all 7 teachers for effectiveness of the knowledge hypothesis practices was 4.2 and for usability 4.1; for the access hypothesis practices the average score was 2.3 for effectiveness and 2.3 for usability; for the instrumental hypothesis practices the average score was 2.7 for effectiveness and 2.6 for usability.

These findings are in direct contrast with Miller (1987) who found, among her sample of the teaching population at large, that the knowledge hypothesis practices were judged as significantly less effective and less usable than practices related to the other vocabulary-reading comprehension connection hypotheses. Based on informal observations prior to staff development, we believe that teachers started the project with similar evaluations about practices as reported in Miller's study. We saw considerable isolated seatwork activity, much drill and practice of reading skills, and little prereading content area instruction. Thus, apparently the staff development and use of the interactive practices made a difference in teacher's recognition and evaluation of the practices.

Teacher's Talking About the Practices

The analysis of the interviews revealed 58 empirical premises about vocabulary practices and reading comprehension instruction. These statements were listed and categorized according to the eight instructional components of the interactive practices and the program of staff development. Eight statements (.13) could not be categorized and reflect beliefs about the reading process not associated with the knowledge hypothesis or interactive teaching.

At the time of the interview, it was apparent that teachers had adopted some language reflecting the knowledge hypothesis. The largest proportion of empirical statements were categorized as "activate prior knowledge," (11 statements; 18% of the total); "tie old knowledge to new," "predict relationships," and "teach concepts in relation to content," (9 statements each; 15% each of the total). On the other hand, teachers said little about "justifying" and "confirming relational knowledge" (2 statements each; .03% of the total each). Likewise, the notion of "cooperative knowledge sharing" evidently made little impact upon these teachers (1 statement; .01% of the total). Ability to talk abstractly and empirically about one's practices is difficult and probably reflects the most sophisticated type of knowledge about teaching. This analysis suggests that the staff development was successful in helping teachers integrate parts of the interactive practices (those parts related to prior knowledge and relating ideas within the content construct), but not so successful in helping teachers rationalize the justifying, cooperating, and confirming aspects of the instruction.

Thus, overall results from the data suggest that teachers were able to do certain aspects of the instruction well, that they evaluated the knowledge hypothesis practices as being effective and usable, and that certain aspects of the practices had been so well internalized that they mentioned them relatively often when asked about them.

Teacher Composites

Collectively the teachers represent a broad range of beliefs and behaviors; individual composites reveal a continuum suggesting developmental differences in the adoption of the interactive practices. From the composites emerged five stages of adoption: (a) two teachers demonstrated ''high language,'' ''high practice,'' and ''high recognition;'' (b) two teachers demonstrated ''high language,'' ''medium practice,'' and ''high recognition;'' (c) one teacher demonstrated ''medium language,'' ''medium practice,'' and ''high recognition;'' (d) one teacher demonstrated ''medium language,'' ''low practice,'' and ''medium recognition;'' and (e) one teacher demonstrated ''low language,'' ''high practice,'' and ''high recognition.'' The two ends of the continuum are presented as exemplars.

Two teachers, numbers 4 and 7, are at one end of the continuum with high adoption of the interactive practices and consistency across the three data points. These teachers' interviews reveal language demonstrating empirical premises supporting the activation and organization of prior knowledge. Similarly, the observational data for both illustrates their high use of teaching functions consistent with their empirical premises (activate prior knowledge and tie new knowledge to old). Survey data reveal that these teachers were not only able to talk about these practices and enact them in their classrooms, they were also able to identify and evaluate practices congruent with these notions.

Teacher number 2 represents the other end of the continuum. She provided one empirical premise regarding activating prior knowledge in her interview. The analysis of teaching functions revealed that she was most concerned with procedural issues and that ''getting through the material'' was foremost on her agenda. She did recognize interactive practices and evaluated them as more effective and usable than the other practices on the survey.

These composite descriptions would be helpful in planning the next steps of staff development. For example, those teachers using little empirical language could be involved in a reflective type staff development while those who were limited in their use of the interactive functions might require coaching or modeling.

SUMMARY

This paper provides methodology for describing the results of staff development. It is particularly encouraging that consistency was found among the three data sources. This methodology also provides a mechanism for determining appropriate types of staff development depending on teachers' knowledge, beliefs, and practices.

These results suggest that the staff development was adequate. However, more importantly, the results indicate the complexity of teachers' knowledge and their use of knowledge in action. Those of us who study teaching and learning have much work to do.

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MENTAL MODELS AND BELIEFS ABOUT CLASSROOMS AND READING INSTRUCTION: A COMPARISON BETWEEN PRESERVICE TEACHERS, INSERVICE TEACHERS AND PROFESSORS OF EDUCATION

Charles K. Kinzer
Vanderbilt University

> Doctors are important, but I don't think they are as important as teachers. Teachers just do everything. They bring out all the potential that's in a child—that's what they try to do. . . . [But] A lot of people think it's just no work. At least a lot of college students do. (Undergraduate student during the last week of student teaching)

During the past several years researchers have become increasingly interested in examining *why* teachers (and especially reading teachers) do what they do in the hopes of discovering directions toward more effective preservice and inservice training in *how* to teach reading most optimally (see, e.g., Anderson, Evertson & Brophy, 1979; Blanton & Moorman, 1987; Borko, 1985; Borko & Cadwell, 1982; Conley, 1986; Duffy & Anderson, 1982; Duffy & Ball, 1986; Duffy, Roehler, & Johnson, 1986; Harste & Burke, 1977; Kinzer & Carrick, 1986; Leu & Kinzer, 1987; Tabachnick & Zeichner, 1985). Generally, researchers in what has come to be called teacher thinking, teacher cognition, teacher beliefs, and so on, have attempted to use various measures and procedures to document why teachers demonstrate specific instructional behaviors. These measures have attempted to classify and categorize teachers by "philosophy" (e.g., skills-dominant, comprehension-dominant), by teaching style (e.g., inductive, deductive), by teaching method (e.g., basal, language experience) and by other categories within which respective teachers' instructional decisions are examined. Favored methods have included the use of questionnaires to place teachers into categories (e.g., DeFord, 1985), forced choice of lesson plans within and across different reading-lesson domains (e.g., vocabulary, syllabication, comprehension) (Kinzer, 1988); observation (e.g., Conley, 1986) or a combination of these approaches.

The above studies and methodologies are indicative of research that has provided much information about how teachers act in classrooms when teaching reading, and have also given us knowledge about possible correlations between teachers' theoretical and philosophical orientations and their teaching behaviors. Many of these researchers agree that examining the differences between preservice and inservice teachers can yield valuable insights into how thought processes might shift as novices acquire teaching expertise. In fact, fostering expertise as quickly and effectively as possible in teacher training programs should be a primary concern of teacher education (Guthrie & Clifford, 1989; Hawley, 1986; Kinzer, Neely, Vye, & Bransford, in preparation) and

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studies that shed light on beliefs and behaviors across experienced and future teachers should be encouraged (Kinzer, 1988; Magliaro & Borko, 1985; Niles & Lalik, 1987; Zeichner & Tabachnik, 1985).

This paper examines the differences between preservice and inservice teachers' "mental models" pertaining to classrooms, procedures, and practices relative to reading instruction. Note that mental models (after Johnson-Laird, 1983) are used as the frame of reference rather than schema. Before explaining further the study per se, a brief discussion of these two theoretical constructs follows.

A VIEW OF MENTAL MODELS IN THIS DOMAIN

Mental models are dynamically built conceptualizations that are not prototypic. They are used herein as descriptive mental images or representations that are modified as new information or experiences occur. Schemas, of course, are closely related. Consider the interaction between schemas and mental modelling, based on Bransford, Barclay and Franks' (1972) "turtle and log" examples (after MacNamara, Miller & Bransford, in press).

Bransford, Barclay, and Franks (1972) showed that subjects who were asked to memorize sentence (a), below, later had difficulty distinguishing whether they had memorized that sentence or sentence (b). This was found in spite of the fact that these sentences describe the same situation. In contrast, subjects had no difficulty distinguishing between (c) as opposed to (d).

Pair 1
(a) Three turtles rested on a floating log and a fish swam beneath them.
(b) Three turtles rested on a floating log and a fish swam beneath it.
Pair 2
(c) Three turtles rested beside a floating log and fish swam beneath them.
(d) Three turtles rested beside a floating log and a fish swam beneath it.

The propositional representation of these pairs of sentences is shown below.

p1: (three, turtles)
p2: (rest, p1)
p3: (floating, log)
p4: (location: p2 on [or beside] p3)
p5: (swim, fish)
p6: (location: p5 beneath p1) [for sentences a & c] vs. (location: p5 beneath p3) [for sentences b & d]

A propositional representation of the difference between the two pairs of sentences differs on identical dimensions in *both* (a and b; c and d) pairs of sentences—that is, only in proposition 6: "p5 beneath p1 vs. beneath p3." Thus, as MacNamara et al. note, " propositional representations alone cannot predict these errors, whereas a model founded on the representation in memory of situations can" (p. 7). It can be argued convincingly that a mental representation created while reading allows a greater understanding of the situation described, and that schemas and mental models interact. A complete discussion of the evidence that implies effects on comprehension from mental modelling is beyond the scope and space constraints of this paper (see, however, Alba & Hasher, 1983; Johnson-Laird, 1983; MacNamara, Miller & Bransford, in press; Morrow, Greenspan & Bower, 1987).

With regard to the possible interaction between schemas and mental models, however, consider, for example, that a reader could not "understand" the situation described in the above sentence examples if there was no schema present for "turtle," "log," "fish," and so on. Also, it seems that a schema could check the validity of statements about fish swimming (perhaps under logs and turtles), but it is the mental, situational representation, or model, built while reading the text that allows more complete comprehension of the overall situation that is described. Excellent overviews of schemas, especially as related to reading, are found in Anderson and Pearson (1984) and Anderson (1985).

Related to the specific study described in this paper, it was postulated that there might be a difference between the mental models that various populations have regarding teaching, even though schemas might be quite similar. For example, groups such as undergraduate students and practicing teachers might have schemas for "classroom" including nodes or features such as "books, chalkboard, desks, students," and so on, but their mental images or "models" of a classroom might be quite different. It is this potential difference between preservice and inservice teachers that is the major focus of the study reported here. A secondary question examines potential differences between these groups and professors of education, chosen because this population could have a major impact on preservice teachers' mental models through teacher education courses.

PROCEDURE

Subjects

Participants were chosen from four groups:

1. Freshmen who were within 2 weeks of completing their "introduction to education" course. This was the only education course these students had taken—no "methods" courses had yet been encountered.
2. Undergraduate students who had successfully completed their student teaching experience.
3. Experienced teachers who were judged to be excellent teachers of reading. These teachers were in the first semester of a graduate degree program in reading education. Judgments were made by their teacher-peers, fellow students, and professors.
4. University professors who were responsible for general professional and educational methods courses (e.g., classroom management, reading education, language arts education).

An attempt was made to work with the top people in each group. To this end, the students who received "A" grades in their introductory education course or in student teaching, respectively, were asked to volunteer to participate. Similarly, excellent teachers, as described above, were asked to volunteer as were professors who had excellent teaching evaluations from students and who had presented reviewed papers at at least two professional conferences during the past academic year. Five people from each of the above-noted populations participated in the study.

Method

Subjects participated in a structured interview at their convenience. Interviews were videotaped and lasted approximately one hour—the shortest was 48 minutes; the longest 65 minutes. All 20 interviews took place within a 9-day span. Interviews followed the structure described below. It was made clear to participants at the outset and periodically throughout the session that questions and responses were to focus on reading and reading education, and that primary grades were the frame of reference.

1. Participants were asked to free associate around "reading instruction" and then "reading teacher."
2. Participants were asked to close their eyes and to build as rich an image as possible of an ideal classroom. Directions included to scan the room noticing all possible details of this ideal classroom environment. Participants were explicitly told that the classroom they were picturing need not be a classroom that had been previously seen. When ready, participants were asked to describe their image in as much detail as possible.
3. Participants were asked to place a teacher into their ideal classroom image. When ready, they were asked to describe where the teacher was in the classroom and to recount what the teacher was doing.
4. Participants were asked to visualize and then describe what a badly managed classroom looks like.
5. Participants were asked to visualize and then describe what a well managed classroom looks like.
6. Participants were asked for descriptors related to their image of "teacher."

SCORING

Interviews were initially transcribed from videotapes. Within each category (for example, category 1—free association around "reading instruction") responses were collated across participants within each group. Consistency of within-group response was assumed when at least 3 of the 5 subjects in a group made similar statements.

Each videotaped segment where consistent responses were found was then edited onto a master tape. This was done across subjects within interview category, and occurred for two reasons. First, ethnographic and qualitative theorists are presenting cogent arguments that data analysis based on only written transcriptions can result in significant loss or misinterpretation of data, and that transcriptions should be at least checked against videotape if outright analysis of video rather than audio segments is not possible (J. Green, personal communication, December 1, 1988).

Second, the editing procedure used in the study reported here allowed linear comparisons across all subjects in close proximity. Based on the arguments noted above, analyzing linearly video segments composed of similar statements across sub-

Table 1

Consistent Responses to "Free Associate Around Reading Instruction and Reading Teacher."

Group	Sample Statements Reflecting Common Themes
Student (premethods)	a. Books, dittoes, workbooks, phonics, basal, children, young, Dick and Jane.
Student (student teaching)	b. Books, dittoes, homework. A circle of students.
Teacher	c. Books, reading groups, worksheets, testing.
	d. Not only knowledgeable of one reading method.
	e. Each student would have a book, reading at own rate, teacher has individual meetings to discuss stories, check comprehension and skills.
Professor	f. Books, writing, multiple representations, alternative explanations, practice, problems and problem solving.

Table 2

Consistent Responses to "Close Your Eyes and Build a Rich Image of Your Ideal Classroom. Describe the Image."

Group	Sample Statements Reflecting Common Themes
Student (premethods)	a. A group of kids and one teacher. A collection of desks that all face the same way.
Student (student teaching)	b. Atmosphere, environment, play. Fun, colorful and bright . . . . Comfortable and a fun place [to be].
Teacher	c. A carpeted area with books that outline three sides of that square carpet. Desks that are together in groups instead of sporadically, three or four at a time, three and four together. The teacher's desk is in the corner, off to the side. There are animals in the room, an aquarium in the room, there are plants growing, kids are measuring new seedlings coming up. On the wall there are charts and charts of the books the kids have published, where the kids have written in the book and the date it was published. There are mobiles hanging down from the ceiling to do with the books that the kids have done followup activities on books that the children have read. And the walls are just cluttered with print that again have come from (and artwork) that have come from the books that the kids have read or written. Lots and lots of books. Books by professional authors and books that the kids have read and published—little paperback books. There's a typewriter in the room. There's print on the chalkboard.
Professor	d. A whole lot of different arenas. Some working together on a project, a group working around a learning center, there might be some working alone. It would be a multitask setting where they were actually doing different things.

Table 3

Consistent Responses to "Describe Where the Teacher Is and What the Teacher is Doing in Your Ideal Classroom Environment, Just Described."

Group	Sample Statements Reflecting Common Themes
Student (premethods)	a. They're standing at the front and they're talking and telling them [students] what to do . . . . Standing behind a minipodium.
Student (student teaching)	b. Always moving around the room, working with the children, leaning over the children. I can see her more with the children at their desks, going around monitoring individual work and just seeing the children at the reading centers or at the science centers by themselves.
Teacher	c. Working with the students, not sitting behind the desk watching them . . . right in the middle with the kids.
Professor	d. A kind of a cognitive map that gets built, and you [teacher] have to grapple with how do I take this concept, and transform it in a way that I'm not just telling kids. That I'm letting them interact with it.

Table 4

Consistent Responses to "Describe a Badly Managed Classroom."

Group	Sample Statements Reflecting Common Themes
Student (premethods)	a. Desks might be out of order, physically disordered. Students are talking to each other and not paying attention to what the teacher wants them to do.
Student (student teaching)	b. Children's papers all over the place. Messy desks. Stuff all over the chalkboard—random stuff not having to do with assignments. Not necessarily neat at all . . . . Noisy without control.
Teacher	c. Focus on the teacher. If the teacher were unduly tense, were being a warden, were taking names, [if it] were an adversarial relationship, I'd think not much learning were taking place. They weren't working together, not much cooperation or communication.
Professor	d. If there's no point of contact between teacher and students. It doesn't always look the same. Some classrooms can be "apparently well managed" because everybody's very quiet "doing school" [but they're not] . . . . Not just noise.

Table 5

Consistent Responses to "Describe a Well-Managed Classroom."

Group	Sample Statements Reflecting Common Themes
Student (premethods)	a. The teacher's in charge. They're directing them. They're standing at the front and are telling them what to do. They're [students] talking about what the teacher wants them to be talking about. The conversation is about the content . . . . Everyone paying attention. Nobody's asleep. They [students] talk when they're called on. They raise their hands—as long as they don't talk when someone else is talking.
Student (student teaching)	b. If the teacher had control, I think it would be fine.
Teacher	c. It's a day to day type of thing. It doesn't happen haphazardly. The teacher has to design and plan for it to happen and has to engineer everything toward that end. She has to have short term goals and long term goals, but hopefully they'd all flow together.
Professor	d. It's extremely well managed because there's a minimum of direct teacher control.

Table 6

Consistent Responses to "Provide Descriptions of Your Image of a Teacher."

Group	Sample Statements Reflecting Common Themes
Student (premethods)	a. Caring, patient, concerned, involved, dedicated.
Student (student teaching)	b. Organized, flexibility, enthusiasm, positive, humorous . . . . Helper, giving knowledge to children, *important*, knowledgeable.
Teacher	c. Nurturing, caring, example, modelling, knowledgeable, professional. Excited, optimistic, caring, interesting/interested . . . . Someone who has developed ideas about how learning takes place so that they can implement it in the classroom.
Professor	d. Organized, professional, knowledgeable, patient, likes children.

jects allows more accuracy regarding agreement between subjects and permits confirmation, elaboration, or rejection of initial decisions that were based on written transcripts.

Within each interview category (e.g., "What does a well-managed classroom look like?"), statements made by three or more of the subjects within a group were compared across the four groups. Based on these sets of comparisons, judgments were made regarding possible similarities and differences in beliefs and mental models between the four groups.

RESULTS AND DISCUSSION

Tables 1 through 6 provide the statements that were made by at least 3 of the 5 participants in each group.

Both levels of undergraduates appear to have a comparatively limited view of the classroom and of reading education in primary settings. This may not be surprising for freshmen, who are drawing largely on their own past experiences, but is somewhat unexpected of the undergraduates who have completed their educational program, including student teaching. The undergraduates' responses center around concrete, material-based items such as books, homework, phonics, and so on, indicating that reading is not something as yet closely linked to comprehension or teaching and learning processes and procedures. Teachers, on the other hand, discuss reading from more of a procedureal and/or methodological base, noting that teaching reading means being knowledgeable of more than one reading method. Teachers acknowledge individual differences and note assessment as well as comprehension and skills. Relative to the other groups, professors use more theoretical and conceptual terms when asked to free associate around reading instruction, viewing reading as a higher-level, cognitive process of multiple representation, problem solving, and so on.

Undergraduates also appear to have fairly limited models of classrooms. Even after detailed prompts to create a rich and vivid image of an ideal classroom, undergraduates did not articulate much more than "comfortable and a fun place." Teachers have the richest images as determined from their descriptions—in fact, the classroom descriptions by teachers lasted approximately 1 to 2 minutes, as opposed 10 to 15 seconds for the undergraduates and 25 to 30 seconds for professors. Teachers felt the details of a classroom were important to instruction, providing such features as a carpeted area, animals, mobiles, chalkboard, and so on. Professors focussed more on classroom arrangements to facilitate cooperative and individualized learning.

An interesting difference appears in the image that the groups in this study have regarding where a teacher *is* in the classroom. Undergraduates (premethods) visualize the teacher in the front of the room lecturing. Undergraduates who have completed student teaching are starting to move from this position—they begin to approximate what *teachers* say: that the teacher is working with the students; is "right in the middle with the kids." Professors give answers that deal more with what teachers *attempt* to do rather than *where* or *how* they do it. For example, professors visualize the teacher as structuring content to allow students to interact with concepts rather than "telling" concepts. Professors did not explicitly state a place where they "saw" the teacher in the class, focusing more on what they viewed as the teacher's role.

There also appear to be differences between groups in their models of well and poorly managed classrooms. Undergraduates closely link badly managed classrooms to noise and mess, with very little notion of what might be called "extenuating circumstances." Teachers link bad management to a focus on the teacher and lack of communication between teacher and students, rather than to students' behavior or to surface features such as noise or messiness. This is similar to professors, who also deemphasized noise as the major indicator of a badly managed classroom, commenting instead on contact and awareness between teacher and students.

The above differences between the undergraduate and other groups is reinforced in the descriptions of a well-managed classroom. Undergraduate students view well-managed classrooms as teacher directed with quiet students who do what the teacher says. Teachers are more sensitive to *planning* when asked to describe well-managed classrooms, noting that this involves awareness of both short and long-term goals, and that management is dynamic and changing. Professors agree, but add that teacher control in a well managed classroom is ''indirect''—that is, the issue is again one of teachers and students working together.

Finally, there is an immense amount of dedication to be found across the teachers, the future teachers and the professors in the sample. Consider the quotation used to open this paper from an undergraduate student who was asked how a doctor differs from a teacher. The following (also from an undergraduate), indicates an awareness and willingness to put forth the effort required to be an effective teacher, and indicates a frustration that the demands of teaching and teacher education programs appear to be unrecognized by her peers:

> One of my friends last night, she said, ''Oh, M————, just think, in one month you'll be done. Done with school. All you'll have to do is student teach.'' I just got furious! I said, ''I will have to prepare every single night for what I'm doing the next day. You stay up all night and study the night before a test, and that's all you do for that test. I will prepare every night.''
>
> And then she, she knew I was mad, so she goes, ''Yeah, well I didn't really think about it. A lot of people prepare hours and hours just to give a 20 minute speech to people, and yet you have to get up and deal with people for six hours a day. I guess it does take a lot of time.''
>
> It does! There won't be a night when I won't have to do something, prepare something—and I want to!

The above quotation was indicative of participants across groups and additional statements from other participants are not listed. The enthusiasm and dedication of the undergraduates in the sample is especially pleasing. Although several differences were noted above between the undergraduates and the other groups, no difference was found in dedication and willingness to work in the profession. There was also considerable similarity between groups in participants' descriptions of teachers.

CONCLUSIONS

Some researchers have argued that it is important to know learners' initial states in relation to end states, in other words, the expected outcomes of instructional programs (e.g., Bransford & Vye, 1989). The research reported here has attempted to provide an indication of undergraduates' ''initial states'' at two stages in their teacher education and to compare those states to goal states as defined by mental models of practicing teachers. A secondary question examined whether there were differences between these groups and professors of education.

The schemas across the four groups were clearly similar. All participants had "reading instruction" schemas that included books, children, worksheets and so on. Similarly, all participants had schemas for "teacher" that included organized, patient, caring, and so on, and schemas for "management" that included noise, mess, and so on. The differences between groups were not found in their schemas, but in their models that make use of these schematic features.

The differences in models were related to placement and use of schematic features and were often delineated in terms of teaching procedures and anticipated goals. For example, even though schemas included a teacher interacting with students in the classroom (note that schemas do not imply only "static" features), differences were found in the placement of the teacher and in teacher action, with freshmen undergraduates placing the teacher at the front of the room in a lecture situation while the other groups placed the teacher in close proximity to the students, working with the students. Similar differences were found between the undergraduates and the other groups throughout the interview categories. Professors have much more theoretical and less "grounded" views than do teachers, falling somewhere between undergraduates' skeletal models and teachers' rich and detailed descriptions. Professors tended to provide descriptions that included more professional "jargon," but that were not as detailed as teachers' descriptions.

If instructional decisions are based on one's view of the world, then a view consisting of teacher-directed, skills-based classrooms may perpetuate itself by a conscious or perhaps even an unconscious choice of methods and procedures that are most suited to this viewpoint. To confront this potential problem, teacher education programs may need to specifically address students' initial-state mental models along with presenting pedagogy. It is encouraging, however, that differences were found between undergraduates and practicing teachers, indicating that undergraduates' mental models may undergo substantial modification on the road to becoming an excellent teacher. It would be an interesting next step to use a similar methodology to explore differences in mental models between good and poor teachers. Such research could discover differences between teachers and could point to factors that might enhance inservice educational programs.

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THE CONTRIBUTION OF SILENT READING WITHIN THE SOCIAL CONTEXT OF INSTRUCTION

Ian Wilkinson
University of Illinois at Urbana-Champaign

Beliefs about the value of silent reading are at odds with both research and conventional practice. Among reading educators, the popular belief is that an emphasis on silent reading promotes growth in reading ability. This is evident in recommendations to teachers that more time be spent in silent, rather than oral, reading during teacher-directed instruction (Durkin, 1987; Harris & Sipay, 1985; Mason & Au, 1986; see also, Anderson, Hiebert, Scott, & Wilkinson, 1985). However, there is not much research to support this belief.

Moreover, surveys and observations of classroom practices show that schools place most emphasis on oral reading in the primary grades (Allington, 1984; Austin & Morrison, 1963; Kurth & Kurth, 1987; Mason & Osborn, 1982), especially for instruction with poor readers (Allington, 1980; Gumperz & Hernandez-Chavez, 1972; Hale & Edwards, 1981; Howlett & Weintraub, 1979; McDermott & Aron, 1978; Quirk, Trismen, Nalin, & Weinberg, 1975). The emphasis shifts somewhat to silent reading in the middle and upper grades but, even at this level, most schools devote a considerable amount of time to oral reading (see Allington, 1984).

This paper is really an argument. My intent is to move discussion away from debate over the relative merits of silent and oral reading to a reformulation that looks at the contribution of silent reading as it occurs in the social context of instruction. Specifically, my intent is to advance a social-organizational hypothesis (cf. Au & Mason, 1981) that states that any positive effects of silent reading may not be found solely in the cognitive consequences for individual students but in the dynamics of the reading group during teacher-directed instruction.

Two qualifications apply. First, exclusive focus is on reading occurring under guidance of a teacher during *small-group lessons*. For several reasons, this is probably the only context in which "debate" over the relative merits of silent and oral reading has relevance for instructional policy: the small group is the most frequent form of organization for reading instruction (Mason & Osborn, 1982; Pikulski & Kirsch, 1979); it offers a common setting in which silent and oral reading can occur (Durkin, 1984); and, teachers evidence considerable variability in how they allocate time to these activities in this setting (see Allington, 1984). It is important to note that comparisons of silent reading in one setting with oral reading in another make results difficult to interpret—results may be attributable to effects of classroom setting rather than to effects of the silent/oral reading task per se. For example, a comparison of oral reading under guidance of a teacher with independent or sustained silent reading may show greater effects of "oral reading" simply because teacher-directed activities foster greater student engagement than do independent seatwork activities (Mason & Osborn, 1982; Soar, 1973; Stallings & Kaskowitz, 1974).

Second, in this paper silent and oral reading are regarded as alternate forms of *guided practice* to promote growth in reading ability. Oral reading can serve additional purposes, namely, for developing skills of communication or oral expression (Artley, 1972; Hosey, 1977) and for diagnosing and evaluating word identification abilities (Durkin, 1987). However, neither function is well-suited to traditional small-group lessons. In this context, the contribution of the communicative function of oral reading to growth in reading ability is unknown. Most likely, effects are small, being mediated by a host of other factors (text genre, audience, etc.). Similarly, effects of the diagnostic-evaluative function of oral reading seem minimal. Research shows that teachers rarely gather information on students' errors during oral reading and seldom use it to modify their instruction (Artley, 1972; Austin & Morrison, 1963; Durkin, 1984; Spache & Spache, 1973). At best, information obtained is impressionistic and reading behaviors manifested probably do not generalize beyond the small-group setting (Heap, 1980; see also, Hale, & Edwards, 1981).

In brief, the present paper is concerned with silent reading in the small-group lesson as a form of guided practice to promote growth in reading ability and is devoted to reanalysis of evidence from three lines of inquiry on the effects of silent reading: experimental studies of text comprehension, causal models relating classroom processes to reading achievement, and microanalyses of group dynamics in small-group reading lessons.

EXPERIMENTAL STUDIES OF TEXT COMPREHENSION

The first line of inquiry comes from short-term experimental studies comparing students' comprehension of text following silent and oral reading. Results are equivocal. Some studies report a significant comprehension advantage for silent reading (e.g., Mead, 1915), others report a significant advantage for oral reading (e.g., Elgart, 1978). Still others report no significant differences in comprehension following silent and oral reading (e.g., Gray, 1956).

A meta-analysis of the studies was conducted by Wilkinson, Anderson, and Pearson (1988). This included results from 29 studies, dating from 1913 through 1986, for a total of 95 comparisons of silent and oral reading. Where possible, study outcomes were expressed in terms of effect size estimates (*ES*), calculated as the standardized mean difference between silent reading comprehension and oral reading comprehension. A positive effect size estimate denoted a comprehension advantage for silent reading. Rather than reporting an average effect size estimate for the main effect of silent reading, effect size estimates were reported for interactions with each of four variables known to influence meaningful processing of text: reader characteristics, text difficulty, learning conditions, and criterial task (cf. Jenkins, 1979, tetrahedral model of learning and memory).

Results from eight studies were discarded. Five of these used informal reading inventories in which the experimenter helped subjects read difficult words in the oral reading condition, but not in the silent reading condition. All results favored oral reading (mean $ES = -.59$). Two comparisons showed extreme effect size estimates for their grade level and were considered outliers (mean $ES = -1.00$ and -1.10). Results from another study were also suspect; they showed a comprehension advantage for oral reading with college freshmen as subjects, at all levels of text difficulty (mean $ES = -.45$)—a highly implausible result given theory and available data.

The remaining studies suggested that the primary determinant of the effect of silent reading was students' grade levels. Below Grade 3, effect size estimates were negative, suggesting a comprehension advantage for oral reading (mean $ES = -.87$). However, only two studies contributed to this finding and both involved second-grade students. At Grade 3, ESs were either positive or negative and, overall, not significantly different from zero (95% $CI = -.43$ to $.09$). Above Grade 3, effect size estimates were mostly positive but the advantage for silent reading showed considerable variability (mean $ES = .17$; $SD = .40$). One explanation for the large variability seemed to be the nature of demands placed on subjects' oral productions. Above grade three, the advantage for silent reading was strongest in studies that imposed time constraints or related demands (e.g., an emphasis on word accuracy) on subjects' oral productions (mean $ES = .40$). Studies not imposing these demands found almost no effect (mean $ES = .02$).

In addition, effects were conditioned by interactions with ability level of the reader, text difficulty, and nature of the comprehension task. A comprehension advantage for silent reading was found with average (mean $ES = .10$) and above average readers (mean $ES = .43$) rather than below average readers (mean $ES = -.47$). The advantage was more often found with texts that were below grade level in difficulty (mean $ES = .48$) than with grade appropriate texts (mean $ES = .03$) or those above grade level in difficulty (mean $ES = -.40$). The advantage was most apparent in tasks requiring inferential comprehension (mean $ES = .28$) rather than literal comprehension (mean $ES = -.12$). These interactions seemed to apply below, at, or above third grade.

In summary, results show there are cognitive consequences of silent reading at the intra-individual level, but perhaps more important, that effects are small—in the order of .2 or .3 of a standard deviation, in terms of population parameters—and very sensitive to the influence of other factors.

CAUSAL MODELS OF CLASSROOM PROCESSES

The second line of inquiry examines causal models of classroom processes influencing students' reading achievement. These are large-scale correlational studies, usually with "disadvantaged" populations, which capitalize on existing variation in classroom practices to correlate time spent reading silently or orally (among other measures of classroom processes) with end-of-year achievement. However, because these studies use existing variation in classroom practices, there is potential for a serious confounding. Teachers assign more silent reading to students in high ability groups and more oral reading to students in low ability groups (Allington, 1983). In addition, better readers have more free time for independent silent reading (Barr, 1986). As such, time spent in silent reading is strongly, positively correlated with entry level ability, and time spent in oral reading is negatively correlated (though the relationship is sometimes weaker). Unless studies control carefully for students' entry level abilities, findings are ambiguous—results may reflect nothing more than existing teacher practices.

Three studies appear to have controlled adequately for students' entry level abilities. Stallings and her colleagues (Stallings, Needels, & Stayrook, 1979; Stallings, 1980) conducted a study of teaching in secondary remedial reading classrooms and examined relationships between time spent reading silently or reading aloud and gains in achievement. They were careful to examine relationships at several ability levels and conducted a follow-up experimental study in which changes were made in relative emphasis placed on a range of teaching activities—including times allocated to silent and oral reading. Hence, it was unlikely that effects were confounded with student ability. Results showed time spent in silent reading was negatively related to achievement gains. In contrast, time spent in oral reading was positively associated with gains in students' reading achievement.

A reanalysis of data from Leinhardt, Zigmond, and Cooley (1981) also provides relatively reliable evidence on the relationship between silent reading and student achievement. They investigated practices in primary grade classrooms for learning disabled students. In an otherwise exemplary study, they found that time spent in silent reading was positively related to gains in reading achievement. However, using structural equation modeling and a multiple indicator approach to measurement of student abilities—so that entry level ability was more fully controlled—Wilkinson, Wardop, and Anderson (1988) found that silent reading no longer showed a significant relationship to gains in achievement. In contrast, under alternative models of the data, there was even the suggestion that time spent in oral reading had a greater, and almost significant, relationship with gains in reading achievement.

Finally, a recent analysis I conducted of data from Meyer, Linn, and Hastings' (1985) longitudinal study of reading comprehension development provides further indications. Data were from third-grade students in a regular classroom environment and they enabled analysis to be restricted to just those activities occurring in the context of the small-group lesson. Meyer et al. (1985) employed multiple indicators of student ability so, by using the estimated factor scores of these indicators, I was able to account more adequately for differences in student's entry level abilities. Rather than using reading time, the metric used was the *number of oral/silent reading interactions*—instances in which teachers had students read a sentence, paragraph, or passage orally as opposed to silently. For interactions occurring only in the small-group lesson, results suggested that silent reading may contribute positively to posttest performance, when I controlled for pretest scores, school district, and type of teacher feedback (terminal, sustaining, confirming)—though it should be noted that the regression coefficient was only marginally significant. For those interactions occurring in all instructional contexts (e.g., reading, social studies, science), the result for silent reading was stronger and significant.

Probably the best interpretation of these correlational studies is that silent reading is not associated with achievement for low ability readers. Both Stalling's (1980) and

Leinhardt et al.'s (1981) studies involve poor readers, so results might be attributable to the low level of reading performance and difficulty of reading materials (see Barr, 1986). For these students, oral reading may be more beneficial, perhaps because it places greater demands for participation and promotes teacher feedback in response to errors (cf. Hoffman, 1981). For students in a regular classroom environment, there may be some benefits of silent reading though results are only tentative at this point.

MICROANALYSES OF SMALL-GROUP LESSONS

The third line of inquiry comes from microanalyses of reading during small-group lessons. These provide relatively finegrained analyses of effects of silent reading on group dynamics or patterns of teacher-student interaction. No new results are presented here. Rather, I draw on existing work to advance a social-organizational hypothesis to explain how silent reading might operate in the small-group setting to influence growth in reading ability.

Based on previous work, especially that of Allington (1977, 1980, 1983), but also of Eder and Felmlee (1984), Heap (1980), McGill-Franzen and McDermott (1978), and others, I argue that factors specific to the small-group setting might co-vary with silent (or oral) reading activities conducted by the teacher and differentially influence learning. Much of this work comes from analysis of oral reading lessons. Hence, effects of silent reading must often be inferred by way of contrast with findings for oral reading. There are at least three candidate factors.

The first is *pacing*. Silent reading is more efficient than oral reading (i.e., more words read per minute) even for students in primary grades (Harris & Sipay, 1985). In small-group lessons, therefore, silent reading should permit a faster pace (Allington, 1980, 1983) and hence contribute greater gains in reading achievement (Barr, 1973–74, 1975). At face value, pacing would seem to have little to do with group dynamics. However, although the underlying mechanism by which this factor leads to achievement is not clear, presumably the explanation lies in some aspect of group process (cf. Barr & Dreeben, 1983). Presumably, also, pacing might have concomitant effects on group discussion; time not needed for reading may be time the teacher and students can use to engage in more fulsome discussion of the story.

The second factor involves *student participation* in the lesson. Silent reading lessons may foster greater participation because all students can be directly engaged in reading. By contrast, the turn-allocation routine of oral reading lessons allows only one child at a time to be actively engaged, whereas the other students are required to "maintain interest in an activity they cannot partcipate in directly" (Eder, 1982, p. 255). An alternate view of this draws on Kounin and Sherman's (1979) notions of the "holding power" of the "signal systems" found in different instructional events. As noted by Allington (1983), silent reading lessons offer a single continuous signal source, namely the teacher. By contrast, oral reading lessons offer multiple shifting signal sources, namely the teacher, the oral reader, and other group members who are vying for attention. Kounin and Sherman (1979) show that lessons with a single continuous signal source have a greater holding power than lessons with multiple shifting sources.

Research attests to a "propensity to inattention" with oral reading lessons. Studies show that errors made by oral readers foster teacher interruptions and student call-outs to correct the error (Eder, 1982; Heap, 1980). According to Allington (1977, 1980, 1983), the interruptions and call-outs disrupt the continuity of lessons, draw attention away from the story, and increase off-task behavior. Moreover, effects may be cyclical. There is some evidence to suggest that teachers' attempts to correct an error cause fewer words to be read (Niles, Winstead, & Graham, 1977) and serve only to increase error rates (McGill-Franzen & McDermott, 1978; see also, Pehrsson, 1974). Likewise, attempts to control call-outs may increase students' off-task behaviors (Eder, 1982).

The third factor is what might be called *performance norms*. There is the claim that silent reading encourages an emphasis on meaning rather than on decoding or word accuracy. Durkin (1981) is a major proponent here, though similar observations have been made by Hale and Edwards (1981) and Heap (1980). Essentially, the argument is that silent or oral reading influences the beginning reader's perception or tacit theory of what constitutes "reading." In Durkin's (1981) words: " . . . persistent attention [to oral reading] may encourage children to conclude that reading is a performing art, not a thought-getting process" (p. 542). The underlying mechanism by which this effect occurs is not clear. No doubt, frequent interruptions to correct oral reading errors reinforce norms of reading as a "performing art." Perhaps, though, the different evaluative criteria used in silent and oral reading lessons have the effect of producing different student perspectives on norms governing successful performance (cf. Heap, 1980). As Allington (1983) points out, adequacy of silent reading is often judged on the basis of students' responses to postreading comprehension questions—performance norms emphasizing story understanding, whereas adequacy of an oral reading performance is often judged on accuracy of students' verbalizations of text—norms stressing "saying the words right." Moreover, even if postreading questions do follow oral reading, they may not necessarily serve the function of assessing comprehension. Frequently, they are "discipline questions" (Brophy & Good, 1970) to check that students are attending and to draw their attention back to the task where necessary.

As far as effects on learning are concerned, research shows that small-group lessons with an emphasis on meaning contribute greater gains in reading achievement than do lessons with an emphasis on decoding or word accuracy (Anderson, Mason, & Shirey, 1984; Martin, Veldman, & Anderson, 1980).

CONCLUSION

Taken together, evidence from three lines of inquiry provides a fairly coherent account of effects of silent reading. It suggests that conventional ideas about the value of silent reading may have to be reformulated to take account of effects of instructional context (i.e., the small-group lesson).

To review, experiments examining the effects on text comprehension show that silent reading may have positive effects, but the effects are small and highly sensitive to the reader's ability, the difficulty of the text, and the nature of the comprehension task. Hence, if effects at the intra-individual level are as variable as the results indicate, then it is not unreasonable to suppose they may be equally susceptible to factors associated with instructional environment. Research examining causal models of classroom processes attests to the influence of these variables; the studies demonstrate that while silent reading may have long-term positive effects, presumably other "inter-individual" factors are important in the classroom context. Finally, microanalyses of small-group reading lessons help specify those candidate factors likely to mediate or moderate the effects of silent reading in the small-group lesson (i.e., pacing, student participation, and performance norms).

Therefore, if beliefs about the value of silent reading are correct, there is good reason to believe positive effects may not be found solely in cognitive effects at the intra-individual level, but in the social organization of the reading group at the inter-individual level. Such an hypothesis is consistent with recently espoused social-constructivist views of learning, based on Vygotsky's (1962, 1978, 1981) notions of the social origin of individual mental processes. According to these views, conditions in small-group lessons take on special theoretical importance for permitting inter-individual functioning to influence intra-individual functioning and student learning (see Bruner, 1985; Cazden, 1988; Green & Harker, 1988; Wertsch, 1985). Two variants of the social-organizational hypothesis are possible. One is that inter-individual or group effects may be so strong, relative to intra-individual effects, as to override cognitive effects specific to the silent reading task. Alternatively, both inter-individual and intra-individual factors may contribute jointly to benefits of silent reading (R. M. Weber, personal communication, December, 1988). Research is needed to examine the relative contribution of inter- and intra-individual effects of silent reading within the context of small-group lessons.

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THE EVOLUTION OF PRESERVICE TEACHERS' KNOWLEDGE STRUCTURES

Beth Ann Herrmann
University of South Carolina

The emerging image of the teacher as "thoughtful professional" has inspired increased interest in studying teachers' developing cognitions and the teacher education process (Peterson, 1988). In the past 5 years, much has been learned about the development and organization of teachers' knowledge structures (Herrmann, 1987; Johnson, 1987; Leinhardt, 1983; Leinhardt & Greeno, 1986; Leinhardt & Smith, 1985; Roehler, et al. 1987; Wilson, Schulman & Richert, 1987). Much more needs to be learned, however, about the longitudinal development of preservice teachers' knowledge structures and interrelationships between the teacher education process, teachers' developing cognitions, and teachers' instructional performance. Exploratory in nature, this study represents a beginning in this direction.

This study is based on previous research on teachers' knowledge structures which indicates that over time, some teachers' knowledge structures become more global and complex than others, and that teacher education plays a significant role in the development of preservice and inservice teachers' knowledge structures (Herrmann, 1987; Leinhardt, 1983; Leinhardt & Greeno, 1986; Leinhardt & Smith, 1985; Wilson, Schulman & Richert, 1987). For example, studies of preservice teachers' knowledge structures about teaching reading indicate that (a) preservice teachers who have well-organized and coherent knowledge structures about teaching reading exhibit more adaptive teaching actions than preservice teachers with less organized and coherent knowledge structures, and (b) integrated field experiences provided in preservice reading methods courses seem to expedite the organization of knowledge about reading instruction (Herrmann, 1987; Johnson, 1987; Roehler, et al., 1987).

Although these studies provide insight into the development of teachers' course-specific knowledge structures, they do not provide insight into how preservice teachers' knowledge structures develop across an entire teacher education program. This study describes the longitudinal development of the knowledge structures of seven preservice teachers as they move through three phases of a teacher education program: Phase I includes a teacher effectiveness course and a practicum course, Phase II includes various methods courses, and Phase III includes 15 weeks of student teaching. Table 1 provides a general overview of the content of these courses.

This study also explores specific aspects of teacher education courses that influence preservice teachers' knowledge structures and interrelationships between these and their classroom instructional performance. The hypotheses are that, over time,

Table 1

Description of Courses

Course	Catalog Description	Sample Topics	Sample Requirements
Teacher Effectiveness Course	Introduction to effective classroom instruction, educational settings and the nature of student learning.	Teacher instructional behaviors and student outcomes Instructional decision-making Teacher-student interaction School effectiveness	Field-based school observations; debriefing sessions and written reports Assigned readings
Practicum Course	General classroom methodology, materials and technology.	Learning environments Child behavior Instructional planning Writing instructional objectives Interpersonal communication skills	Guided classroom observations and participation Development of lesson plans and learning activities Journal-writing Bulletin board Microteaching
Sample Methods Course (Reading)	Nature of the reading process; methods for developing effective reading.	Literacy Process, content, attitude outcomes The literate environment Metacognition	Written analysis of children's reading abilities Practice teaching Coaching sessions Journal-writing
Student Teaching	Teaching and related experiences.	Classroom management Methods Materials	15 weeks of supervised teaching Seminars Workshops

preservice teachers' knowledge structures are systematically organized into highly integrated cognitive structures about effective teaching and the more highly integrated the structures are, the closer the link between teacher thought and teacher instructional actions.

Three research questions are posed: (a) Do preservice teachers' evolving knowledge structures become more extensive and coherent as knowledge is acquired in teacher education courses? (b) Do preservice teachers' knowledge structures become more integrated as knowledge is acquired across various teacher education courses? (c) Is there a relationship between teachers' knowledge structures and their instructional actions? This study is currently in progress. This paper describes the Phase I and II knowledge structure development of 3 of the 7 preservice teachers (Students A, C, and G) and focuses on only the first two research questions.

METHOD

Subjects

Subjects were one female Elementary Education major and 2 female Early Childhood Education majors who had completed the teacher effectiveness course, the practicum course and a reading methods course. These students are part of a 7-student sample who were selected in 1987 from among 20 juniors beginning Phase I of a teacher education program in a large southeastern university. All 7 students had completed the same basic required courses and agreed to participate in the study during all three phases of the teacher education program.

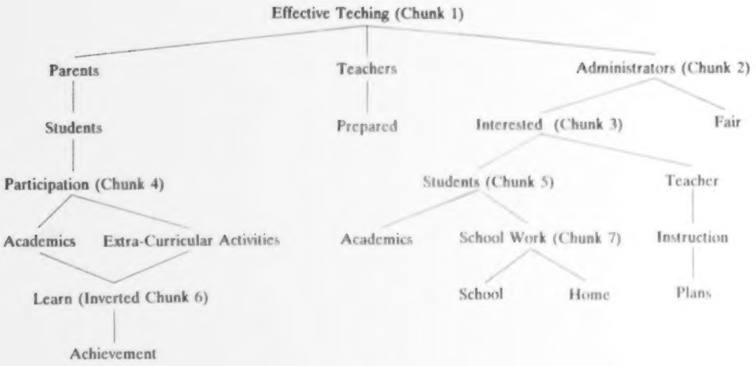
Materials

To measure the development of the preservice teachers' knowledge structures, subjects constructed an ordered tree (Naveh-Benjamin, McKeachie, Lin, & Tucker, 1986) at the beginning of each course, at the semester midpoint, and at the end of each course. The ordered tree technique allows persons to display how concepts included in their knowledge structures are tied together into a network of relationships. A sample ordered tree about effective teaching is shown in Figure 1.

Prior to the beginning of the study, subjects were oriented to the ordered tree concept. The orientation included a description of the characteristics of an ordered tree and practice in constructing one (Roehler, Herrmann, & Reinken, 1989).

Procedures for Constructing Ordered Trees

Subjects followed a three-step procedure when constructing ordered trees. First, they brainstormed and listed words and phrases about effective teaching, categorized them, and labeled each category. Second, they arranged these categories into a network showing relationships between and among the groups. Third, immediately following the construction of each ordered tree, subjects completed an audiotape recording and/or a written description of how concepts and groups of concepts in the ordered tree were related and how various aspects of the teacher education program influenced their thinking.


Effective Teching (Chunk 1)
Parents
Teachers
Administrators (Chunk 2)
Students
Prepared
Interested (Chunk 3)
Fair
Participation (Chunk 4)
Students (Chunk 5)
Teacher
Academics
Extra-Curricular Activities
Academics
School Work (Chunk 7)
Instruction
Learn (Inverted Chunk 6)
School
Home
Plans
Achievement

Numerical Measure

	Raw Score	*Rating*
Concepts	21	3
Chunks	7	2
Average Number of Concepts per Chunk	3	8.5
Horizontal Levels of Chunks (6) and Chunks at the Widest Point (1)	7	3

Overall Numerical Score = 4.1 (x Rating Score)

Coherence Measure

	Raw Score	*Rating*
Coherent Chunks	5 out of 7 (71%)	7.1
Coherent Vertically Extended Sequences	7 out of 7 (100%)	10.0

Overall Coherence Score = 8.6 (x Rating Score)

Figure 1. A sample ordered tree about effective teaching.

Procedures for Analyzing Ordered Trees

The ordered trees were analyzed twice, once to measure the extensiveness and coherence of the ordered trees and a second time to determine the extent to which knowledge acquired across the courses was integrated.

Extensiveness and coherence. Two critical categories, a numerical measure and a coherence measure (Roehler, Herrmann & Reinken, 1989), were used to measure the extensiveness and coherence of the ordered trees. Both measures were adapted from Naveh-Benjamin, McKeachie, Lin and Tucker (1986) and were validated in an earlier study (Roehler et al., 1987).

For the numerical measure, the researcher counted: (a) concepts, (b) chunks (clusters of concepts), (c) the average number of concepts per chunk, and (d) a combination of horizontal levels of chunks and chunks at the widest point. These criteria were used because studies of various experts' and novice learners' ordered trees revealed that novice learners' ordered trees varied greatly for each of these categories, whereas experts' ordered trees were structurally similar, having about 100 concepts, about 30 chunks, an average of about 2.5 concepts per chunk, and a combination of horizontal levels and chunks at the widest point of about 25 (Roehler, Duffy, Herrmann, Conley, & Johnson, 1988). Figure 2 shows a standard 10-point rating scale, based on experts' ordered trees, used to convert the numerical scores to ratings which were averaged to obtain an overall numerical score (Roehler et al., 1987).

To illustrate how the numerical measure was used, consider the sample ordered tree about effective teaching shown in Figure 1. This ordered tree contains: (a) 21 concepts (words and phrases); (b) seven chunks labeled *effective teaching*, *administrators*, *interested*, *participation*, *students*, *learn*, and *school work*, (c) an average number of three concepts per chunk; and (d) a combination of horizontal levels of chunks and chunks at the widest point of seven. An overall numerical score was determined by averaging ratings assigned to each of these categories.

The coherence measure determines the extent to which relationships between concepts are logical. The coherence measure was used because, in examining a variety of trees in earlier studies, novice learners' ordered trees varied greatly whereas experts' ordered trees consistently followed the logic established in required methods textbooks (Roehler, Duffy, Herrmann, Conley, & Johnson, 1988). Only relationships within individual chunks and across vertically extended sequences of concepts were scored. First, using the student descriptions of how concepts and groups were related, chunk coherence was determined by examining relationships between concepts included in each individual chunk. One point was awarded to each chunk in which relationships depicted among concepts were logical. The percentage of coherent chunks was then computed and converted to a rating (e.g., 87% = 8.7). Second, coherence across vertically extended sequences of concepts was determined by examining relationships among concepts included in each vertically extended sequence with one point awarded for each vertically extended sequence containing logical relationships among concepts. The percentage of coherent vertically extended sequences was then computed and converted to a rating. An overall coherence score was obtained by averaging the two coherence ratings.

To illustrate how the coherence measure was used, consider again the sample ordered tree about effective teaching shown in Figure 1. The figure shows that 71% of the individual chunks and 100% of the vertically extended sequences (e.g., effective teaching→administrators→interested students→academics) were judged to be coher-

RATING	1	2	3	4	5	6	7	8	9	10	9	8	7	6	5	4	3	2	1		
CONCEPTS	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
CHUNKS	3	6	9	12	15	18	21	24	27	30	33	36	39	41	44	47	50	53	56	59	62
AVERAGE CONCEPTS PER CHUNK	4.6	4.4	4.2	4.0	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.2	2.0	1.8	1.6	1.4	1.2	1.0		
COMBINED DEPTH AND WIDTH	0	2.4	4.8	7.2	9.6	12	14.4	16.8	19.2	21.6	24	26.4	28.8	31.2	33.6	36	38.4	40.8			

Figure 2. Rating scale for determining ratings assigned to numerical categories.

ent. Chunk 1 was judged to be incoherent because the grouped concepts included in the chunk (effective teaching, parents, teachers, and administrators) are illogically connected because teachers and administrators are directly involved with effective teaching but parents are not. The percentages and ratings assigned to each coherence category and the overall coherence score for the sample ordered tree also are shown in Figure 1.

Coherence rating was conducted by two graduate students trained to use a two-step procedure. First, following conventions for independent scoring established during training, each rater independently scored each tree. Second, the raters discussed discrepant scores until 100% agreement was established.

Integration. Each student's final ordered trees from each of the three courses were compared to determine the extent to which knowledge acquired from the courses was integrated. Knowledge was considered to be integrated if two criteria were met: (a) three or more chunks were repeated across the final ordered trees *and* (b) a combination of newly acquired concepts and concepts acquired in earlier courses were included in each repeated chunk.

The researcher followed a two-step procedure to determine integration. First, chunks repeated across ordered trees were identified. Second, these chunks were examined to determine the extent to which newly acquired concepts were linked with concepts acquired in earlier courses.

RESULTS

For this paper, 21 ordered trees were analyzed. From Phase I, each student's final teacher effectiveness course ordered tree and each student's three practicum course ordered trees were analyzed. From Phase II, each student's three reading methods course ordered trees were analyzed.

Changes in Extensiveness and Coherence

Overall numerical and coherence scores were studied to identify patterns of changes in each student's knowledge structure about effective teaching. As shown in Table 2, the numerical score for each student's final practicum course ordered tree is lower than the numerical score for her final teacher effectiveness course ordered tree, and with the exception of Student G, the numerical score for each student's final reading methods course ordered tree is lower than the numerical score for each student's final teacher effectiveness course ordered tree. In contrast, the coherence score for each student's final practicum course ordered tree is higher than the coherence score for each student's final teacher effectiveness course ordered tree, and, with the exception of Student G, the coherence score for each student's final reading methods course ordered tree is higher than the coherence score for each student's final teacher effectiveness course ordered tree. In sum, as noted in an earlier report (Herrmann, 1988), preservice teachers' knowledge structures tend to become less extensive, but more coherent over time.

Table 2

Overall Ordered Tree (OT) Numerical and Coherence Scores

	Teacher Effectiveness Course	Practicum Course			Reading Methods Course		
	OT#3	OT#1	OT#2	OT#3	OT#1	OT#2	OT#3
	Overall Numerical Scores						
Student A	7.8	4.5	7.6	2.8	6.8	3.0	5.8
Student C	5.0	1.8	2.4	3.0	2.9	2.5	2.4
Student G	2.4	2.0	3.6	1.8	2.6	3.6	4.0
	Overall Coherence Scores						
Student A	7.1	9.3	8.7	7.5	6.3	6.7	9.7
Student C	6.5	9.0	7.2	8.9	10.0	10.0	10.0
Student G	9.0	7.0	9.8	10.0	7.7	8.2	8.2

Note. OT#1, OT#2, and OT#3 refer to the ordered trees constructed in each course.

Evidence of Knowledge Integration

None of the students repeatedly used three or more chunks when constructing the final ordered trees. For each student, each final ordered tree contained only concepts acquired in the course for which the ordered tree was constructed.

DISCUSSION

Preliminary findings from this study tend not to support the hypothesis that, over time, preservice teachers' knowledge structures are systematically organized into highly integrated cognitive structures about effective teaching. Rather, results suggest that as students move through a teacher education program, they acquire new concepts about effective teaching from specific courses but they do not systematically organize and integrate these concepts with concepts acquired in previous courses. Instead, each semester, students simply replace "old" concepts in their cognitive structures with new concepts from the more recently completed courses. Previously learned concepts are either dropped from the structure or reduced to an "unretrievable" state. Although it is not particularly disturbing that these preservice teachers' developing knowledge structures completely changed as they moved through various teacher education courses, it is somewhat disconcerting that they were unable to integrate "old" and "new" knowledge.

There are three possible explanations for why the students' did not integrate new and old knowledge in their knowledge structures. First, because the three courses lacked cohesion, it may have been difficult for the students to integrate concepts from one course to another. Second, the students' preoccupation with course evaluation criteria may have inhibited their ability to interconnect new concepts with existing knowledge. Third, the students' concern with practical information (e.g., How do you get children to stay in their seats?) may have distracted them from examining interrelationships among complex concepts taught in the three courses (e.g., teacher and student cognition).

Given these preservice teachers' current knowledge structures, one must assume that they will have considerable trouble accessing and using their professional knowledge when faced with instructional dilemmas (e.g., a student misunderstands instructional information). It may be true that concepts apparently "lost" over time are not really lost at all but simply cannot be retrieved, but the fact remains that sooner or later, in the midst of a complex instructional situation, it may be necessary for these teachers to retrieve and use those concepts to maintain teacher cognitive control of instruction. If these teachers are having trouble retrieving and/or integrating concepts as they move through their teacher education program, will they be able to make effective use of these concepts when teaching?

The emerging image of the teacher as "thoughtful professional" demands that we take a closer look at the quality of instruction provided in teacher education programs and the quality of the structure of these programs. If some preservice teachers are experiencing difficulty integrating newly learned concepts with existing knowledge because teacher education programs lack cohesion, would results be different if teacher educators worked together to create such cohesion and show preservice teachers how to network concepts taught within and across various courses? If some preservice teachers are more concerned with achieving acceptable course grades than they are with developing an integrated network of knowledge about effective teaching, would results be different if teacher educators seriously considered alternative course assignments, requirements and evaluation techniques that redirect preservice teachers' attention toward integrating and refining knowledge? Finally, if some preservice teachers are experiencing difficulty with understanding complex concepts because they are too preoccupied with uncertainties about classroom complexities, would results be different if teacher educators explored ways to help preservice teachers deal with such uncertainties while at the same time helping them develop a conceptual understanding of more complex concepts? This research represents a beginning effort to explore such questions about teacher education effectiveness.

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AN EXPLORATION OF TEXT READING AND READING GROUP PLACEMENT OF THIRD-GRADE STUDENTS

Diane E. DeFord
Ohio State University

This paper presents findings of a follow-up study of text reading and reading group placement with children originally participating in the research of the Reading Recovery Program in the 1985-86 school year (DeFord, Pinnell, Lyons, & Young, 1988; Pinnell, DeFord, & Lyons, 1988; Pinnell, Short, Lyons, & Young, 1986). The study explored two basic research questions that were separate, but related: (a) What is the difference between the level of text at which readers can read orally at or above 90% accuracy and the text level they must use within their reading group? and (b) What factors do teachers report influencing their decision-making in placing readers within their classroom reading group?

Within the Reading Recovery program, Clay (1985) includes four key components of a reading program within the individual lessons for at-risk readers. These are: (a) the reading of easy, or familiar materials; (b) teacher observation of reading behavior around which instructional decisions are made; (c) student writing; and (d) challenge reading.

The first component, the reading of familiar material, allows the reader to orchestrate strategies and build fluency. This has been shown to be important in allowing the child to focus on comprehension rather than print (DeFord, 1988). The second component places the teacher in the observer's seat so that a careful analysis of the reader's strategies can be made. The inclusion of writing within the reading lesson allows the reader to look at print in a productive manner so that the relationship between what is said and how it is produced can be explored. Within the fourth component, the teacher selects material that will encourage the reader to do "reading work," or challenge their reading strategies. Clay recommends teachers monitor their selections by establishing a 90% or above criterion level for accuracy. Children can best use personal strategies to solve their own reading problems when the text allows them to best orchestrate what they know. They can use the reading process, maintaining use of language cues and meaning cues while checking these sources of information against visual information (DeFord, 1988). By combining these components into a reading program, each child develops a self-improving reading system and achieves accelerated learning in reading.

This notion of challenge reading allows continued growth. Therefore, a question is, "Will readers continue to meet challenging reading within the classroom reading program?" If they do encounter challenge in the materials they read, then they can push their own boundaries in terms of reading, or continue the process Smith (1988) characterizes as learning to read through reading.

METHOD

Subjects

The population originally sampled in the 1985–86 Reading Recovery research were tested as third graders. The original study randomly assigned children to Reading Recovery ($n = 131$) and Comparison ($n = 51$) groups from tests administered to the lowest 20% of the first-grade children in 12 inner-city schools from Columbus, Ohio at the beginning of that academic year. Of the total group of Reading Recovery children, 96 were considered discontinued (that is, no longer needed Reading Recovery services) and 37 were identified as not discontinued by the end of the 1986 academic year. By the spring of 1988, the groups were depleted in size due to student mobility (Reading Recovery $n = 103$; Comparison $n = 42$). A random sample of 65 third graders from the 12 original schools were selected for the current study as a means of determining what typical third graders would do in the same situation.

. . .

Procedures

In order to explore the first question, children from Random Sample ($n = 65$), Reading Recovery ($n = 103$) and Comparison ($n = 42$) groups were asked to read orally from texts selected from the Ginn Basic Reading program in a typical informal reading inventory procedure. There were 30 Text Levels covering first-to-eighth-grade reading materials in the basal reading program, with many levels for the first two grades and two levels per grade thereafter. (Readers began at Text Level 6.) Trained testers initiated student reading below their actual text level for reading group placement and asked students to continue reading until they read two consecutive levels below 90% accuracy. Testers marked the in-progress reading utilizing Clay's (1985) Running Record marking system. Testers were unaware of group designation.

During the testing period in the spring of 1988, the classroom teachers were interviewed as to student placement in reading groups and factors they used in placing students in these groups. (Reading group designations were established as follows: 4 = high; 3 = high average; 2 = low average; 1 = low). Itemized responses from these teacher interviews were used to answer the second research question.

Analysis

Three separate statistical analyses were used to address the question related to text reading versus reading group placement. First, correlations among Text Level Read, Level of Basal Placement, and Reading Group Placement were conducted for each of the groups of students categorized as Random Sample, Reading Recovery Discontinued, Reading Recovery Not Discontinued and Comparison. Utilizing a 4 × 4 factorial design, dependent measures of Text Reading Level and Basal Placement were tested against independent variables of Reading Group Level and Group Status in a multivariate procedure (MANOVA). Finally, data were analyzed with a Log-linear (Kennedy, 1983) categorical analysis to determine degree of overplacement, target placement and underplacement by group status in a 4 × 3 (Group × Basal Reading Comparison) design.

Teacher interviews were coded into five decision-making categories: School History, Assessment Data, Reading Behavior, Classroom Behavior, and Pragmatics. Frequencies were determined within the taxonomy developed from interview protocols based upon the first, second, third, fourth, and fifth responses given.

Findings

Data for the first research question were as follows.

Correlation. In order to determine the relationship that exists among Text Reading Level, Basal Reading Placement, and Reading Group Status, a Pearson Correlation procedure was utilized for each of the four group designations (Random Sample, Reading Recovery Discontinued, Reading Recovery Not Discontinued, Comparison). Significant correlations existed among Text Reading Level, Basal Reading Placement, and Reading Group Status for the Random Sample, Reading Recovery Discontinued,

Table 1

Correlations Among Text Reading Level, Basal Reading Placement, and Reading Group Status

	Variable		
Group	Text Reading Level	Basal Reader Placement	Reading Group Status
Random Sample[a]			
Text Reading Level	—	.735*	.660*
Basal Reader Placement	.735*	—	.600*
Reading Group Status	.660*	.600*	—
Discontinued Reading Recovery[b]			
Text Reading Level	—	.606*	.591*
Basal Reader Placement	.606*	—	.450*
Reading Group Status	.591*	.450*	—
Comparison[c]			
Text Reading Level	—	.808*	.327
Basal Reader Placement	.808*	—	.871*
Reading Group Status	.327	.871*	—
Not Discontinued Reading Recovery[d]			
Text Reading Level	—	.308	.213
Basal Reader Placement	.308	—	.034
Reading Group Status	.213	.034	—

[a] $n = 65$. [b] $n = 76$. [c] $n = 42$. [d] $n = 27$.
*$P < .01$.

and Comparison groups. For the Not Discontinued group, however, the correlations among these variables were not significant (see Table 1).

Multivariate analysis. As a result of the multivariate analysis, statistically significant multivariate *F*s (Group Status, Wilk's Lambda = .72, $F = 11.6$), $p < .0001$; Reading Group Placement, Wilk's Lambda = .68, $F = 13.91$, $p < .0001$) allowed rejection of the overall null hypothesis of no difference in group status and no difference in reading group placement. Examination of the univariate *F* ratios indicated significant main effects ($p < .01$) for both Group Status, $F(3, 198) = 21.01$ and Reading Group Placement $F(3, 198) = 16.56$ when Basal Reading Level was the dependent variable, and again for both Group Status $F(3, 198) = 18.27$ and Reading Group Placement when Text Reading Level was the dependent variable.

Post hoc analyses utilized Duncan's Multiple Range Test (see Table 2). For both Basal Reading Level and Text Reading Level variables, there were no significant differences between Reading Recovery Discontinued and Random Sample groups. The Comparison group scored significantly lower than both Reading Recovery Discontinued and Random Sample groups, and the Reading Recovery Not Discontinued group scored significantly lower than all three other groups ($p < .05$).

When subjects were classified by Reading Group Status, for both the Basal Reading Levels and Text Reading Level dependent variables, there were significant differences between each group level. That is, the high group scored significantly higher than the high average group which scored significantly higher than the low average group which scored significantly higher than the low group.

Table 2 reports means and grade level equivalents for all groups for both Basal Reader Level and Text Reading Level variables.

Log-linear analysis. Students ($N = 220$) were categorized as being overplaced, at target placement, or underplaced in the basal reading program (Rinehart & DeFord, 1988). Log-linear analysis indicated significant main effects for group [$\chi^2(6) = 25.2$,

Table 2

Means and Grade Level Equivalents for Basal and Text Levels by Groups

	N	Basal Reader Level Placement	Basal Reader Level Grade Equivalent	Text Reading Level	Text Reading Level Grade Equivalent
RS	64	9.33	3.1	23.67	5
RRD	76	9.04	3.1	23.18	5
COM	40	7.75	2.1–2.2	16.50	2.2
RRND	25	6.32	1.2	10.64	1.2
H	41	10.05	3.2	27.98	7
HA	48	9.10	3.1	23.77	5
LA	53	8.11	2.2	19.02	3.2
L	63	7.5	2.1	14.16	2.1

Note. RS = Random Sample Group, RRD = Reading Recovery Discontinued Group, COM = Comparison Group, RRND = Reading Recovery Not Discontinued Group, H = High Group, HA = High Average Group, LA = Low Average Group, L = Low Group.

$p < .01$]. Lambdas were estimated and *z* tests computed (see Table 3). Significant lambdas were found for three cells in the matrix. For both the Random Sample and Reading Recovery Discontinued groups, over 70% of the students were in the underplaced category. On the other hand, 47% of the Reading Recovery Not Discontinued students were in the overplaced category. There were no significant lambdas for the cells for the Comparison group.

To explore the second research question, the first through the fifth responses were assessed for the type and number of factors indicated by the teachers. A total of 216 teachers indicated at least one factor used in deciding about reading group placement, 112 responded with at least two factors, 37 responded with at least three factors, 16 responded with at least four, and 4 teachers indicated five factors. The frequencies are listed in Table 4. From this analysis, it is clear that "Ginn testing materials" can account for 27% of the first responses and 19% of the second responses, whereas "last years records" or "teacher recommendations" account for 30% of the first responses and 18% of the second responses. "Listening to a child read" was indicated by 6% of the teachers as a first response and by 13% of the teachers as a second response. An additional 7% of the teachers indicated "performance in reading groups" as a second response. "Listening to a child read" was offered as the third choice by 30% of the teachers, and "comprehension" was indicated by 37% of the 37 responding teachers as their third factor. By the fourth factor reported, there were only 16 teachers responding. The highest frequency of response occurred on "individualized assessment" which was mentioned by 44% of the responding teachers.

Table 3

Proportions of Membership in Categories of Overplacement, Target Placement, and Underplacement by Group Status

Group	Over	Target	Under	Total
Discontinued				
Frequencies	12	10	58	80
Proportion	.15	.13	.73	1.00
Lambdas	−.369	−.084	.452*	
Not Discontinued				
Frequencies	14	10	6	30
Proportion	.47	.33	.20	1.00
Lambdas	.516*	.363	.879*	
Comparison				
Frequencies	11	12	20	43
Proportion	.26	.28	.46	1.00
Lambdas	−.109	.334	−.225	
Random Sample				
Frequencies	12	3	52	67
Proportion	.18	.04	.78	1.00
Lambdas	−.038	−.613*	.652*	

*Denotes significant Lambda.

Table 4

Frequencies of Teacher Response Relative to Information Used in Placing Students in Reading Groups

Number of Response	*n*	Response Rank	Factor	Frequency
First	216	1	Ginn testing	60
		2	Last year's record	41
		3	Last year's teacher recommendation	23
		4	Listening to child	12
		5	Skill ability	8
Second	112	1	Ginn testing	21
		2	Listening to child	14
		3	Last year's record	10
		3	Teacher recommendation	10
		5	Performance	8
Third	37	1	Listening to child	11
		2	Comprehension	8
Fourth	16	1	Individualized Assessment	7
Fifth	4	1	Last year's record	1
		2	Ginn testing	1
		3	Fluency	1
		4	Dittos and worksheets	1

DISCUSSION

Although this study was initiated as a follow-up of the children randomly assigned to Reading Recovery, the results have far reaching implications to classroom practice. The research suggests that children typically are not placed in the basal reading program with consideration to their specific needs as readers. Rather, they are placed in a basal program for convenience sake or on their ability to pass a skill test. The highest readers could benefit from more challenging materials to reach their highest potential. The lowest readers may be so severely overplaced in their reading program that they cannot advance. The children were from an inner-city school, but the data do not support the need for such a high number of children being placed in the lower reading groups. The management concerns of reading groups in general, unit testing, and the emphasis on workbook exercises may cause the funneling effect indicated within this study. Students may be forced to practice "skills" but may not be able to use the reading process as part of their learning about reading and through reading.

Teachers' decisions about placement are also tied to the basal system. In terms of management, the *test* or a student's *placement* are prominent factors in a teacher's decision. Although a teacher may listen to a child read, this is not part of the primary decision-making process. These data would suggest that the testing included in the basal management system may be more of an influence than other informal means.

In this way, teacher observation and decision-making is left out of the reading curriculum.

In conclusion, the results of this paper indicate that a majority of children can read materials within the basal reading program that are far more difficult than those they are required to read. If children can learn through reading and can have self-improving reading systems as third graders, this brings into question current practices for placing children in reading materials, if that is the sole type of reading the student encounters. Children need to encounter reading materials that challenge their reading, but this challenge also needs to be within the bounds of productive learning. If children must be placed in reading materials that are as easy for them as this study would suggest, then additional reading in good literature must be part of the school day. Teachers must have ways of observing children's use of the process so they can recommend reading materials to stretch children's learning through the use of the reading process itself. Children who were in the lowest groups in this study were overplaced in materials in the basal reading program (47%). In this instance, overplacement in the basal may increase the problems these students are having in the general curriculum—they may not be able to gain access to reading at all, and lag further behind with each year. If, within the regular school program children are not encountering texts other than the basal that may be more suitable to their reading needs, then their continued development as readers may be in jeopardy.

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LITERATURE-SELECTION STRATEGIES AND AMOUNT OF READING IN TWO LITERACY APPROACHES

Kay Mervar
Boulder Valley (CO) School District

Elfrieda H. Hiebert
University of Colorado, Boulder

Recent reports have forced educators to confront the success of schools in developing critical reading, writing, and thinking skills (see, e.g., Applebee, Langer, & Mullis, 1988; Kirsch & Jungeblut, 1986; National Assessment of Educational Progress, 1989). When judged by standards of previous eras, literacy levels may be high, but there is reason to question whether many individuals have the necessary literacy skills to be full participants in workplaces and communities where the ability to interpret, synthesize, and evaluate large quantities of information is a necessity (Kirsch & Jungeblut, 1986).

Efforts at school reform aimed at improving schools' efficacy in achieving high levels of literacy may have had the opposite effect. There is mounting evidence that the emphasis placed by the recent school reform movement on standardized test results has led to a trivialization of instruction as curriculum has been matched to test content (Shepard, 1988). Although American schoolchildren may do well on multiple-choice tests of basic skills, they perform poorly on tasks requiring application and problem-solving (NAEP, 1989). The criteria for evaluating effective literacy programs need to include characteristics of proficient readers that are not now part of typical assessments. We examined the success of two literacy approaches in developing two such attributes of proficient readers: extensive participation in reading and literature-selection strategies.

The first intent was to evaluate the success of programs in achieving the goal of extensive reading. Children who read avidly are part of a community of readers at home or school (Fielding, Wilson & Anderson, 1986). For many children, models of voracious readers are not present in their homes. Furthermore, models of teachers or peers reading extensively and opportunities to participate in periods of reading much longer than 5 or 10 minutes a day are not available in many classrooms (Fisher et al., 1978). Our study sought to establish the amount of reading in which children engaged at school and home.

Although reading instruction tends to focus on word identification and comprehension skills, abilities to choose between books of different quality and to select material that fits one's interests and reading level are part of the repertoire of able readers (Galda

& Cullinan, in press). The second set of measures in our study assessed children's strategies in choosing literature.

We examined students' participation in reading and literature-selection strategies as a function of two instructional approaches—skills-oriented and literature-based. A view of reading as a set of hierarchically-ordered skills has driven American reading instruction for the past several decades. Instruction that emanates from this view emphasizes mastery of individual skills, with the assumption that facility in these adds up to proficient reading. While ability to select appropriate reading material could be included in such hierarchies, typically it has not been included.

A second philosophy emphasizes the constructive nature of reading. In this perspective, which is presently manifest in schools as whole language or literature-based experiences, the active engagement of readers and writers in constructing meaning is the priority. Extensive participation in reading and self-selection of reading material are viewed both as outcomes of literacy instruction and as means of achieving these outcomes.

In the present study, differences in amount of reading and literature-selection strategies between these two approaches were considered as a function of students' reading proficiency. It was hypothesized that high-achieving students would read more extensively in a literature-based approach where constraints on what and how much they read were fewer than in a skills-oriented approach. It is less clear whether low-achieving students, when allowed to make decisions about how much and what to read, struggle or thrive. With regard to literature-selection strategies, it was hypothesized that low-achieving students who generally benefit from teacher guidance for awareness of strategies (Paris, Lipson, & Wixson, 1983) would have a richer array of such strategies in a literature-based approach where such strategies are promoted than in a skills-oriented approach where literature-selection strategies are not a priority. In contrast, high-achieving students in a skills-oriented approach may still acquire such strategies since high-achieving students tend not to depend as much on teacher guidance as their low-achieving peers (Paris et al., 1983).

METHOD

Subjects

The sample consisted of 20 second-grade children. Half came from a literature-based classroom and half came from a skills-oriented classroom. Observations were conducted in each of the classrooms as part of the study. These observations indicated that students in the literature-based classroom spent part of the daily reading period reading independently in books that they had chosen from among several that the teacher presented in book talks that occurred every several weeks. In these presentations, the teacher focused on how to make choices about books based on one's interests and features of books such as the quality of illustrations and writing. Several times a week, children who were reading a similar title met in a small group that included the teacher to talk about their book. Students were also given an extended block of time during each school day to read in self-selected tradebooks. The classroom library from which students chose books was extensive. Students made a weekly visit to the school library where they selected books for home and classroom reading.

In the skills-oriented classroom, the daily reading period consisted of independent and ability group participation in an assortment of worksheet activities and teacher-assigned reading from textbooks. When opportunities for self-selection of reading material occurred in the skills-oriented classroom, they were in the context of the independent reading period which was scheduled after the class's weekly trip to the library.

Half of the children in each class were high achievers and half were low achievers. The number of boys and girls represented in each class and at each achievement level was similar. Both classrooms were located in schools within a suburban school district of a western state.

Materials and Procedures

Data on two types of measures, each related to one of the questions of concern (amount of reading and literature-selection strategies), were gathered.

Amount of reading. Students' reading in the classroom and at home was assessed through logs. Students in the literature-based classroom had kept on-going records of their independent reading. The skills-oriented teacher preferred to keep a log for each reading group since children in the same group were assigned the same passages. Observations of target students were conducted to verify the accuracy of student and teacher documentation, as well as the nature of instructional experiences.

Since tradebooks for primary-level students are predominantly picturebooks which could have less text per page than pages in a typical second-grade reading textbook, the number of words rather than pages was used in the analysis of in-school reading. Determining number of words per page was fairly straightforward for reading in the skills-oriented classroom since all students in the same group read the same pages in the same book. In the literature-based classroom, the number of words on pages from the beginning, middle, and end of each book was averaged. This average was then multiplied by the number of pages for the book. To verify the accuracy of this procedure, five books were chosen randomly and all words were counted. The actual word count averaged 4.5% over the estimated words.

Amount of home reading was established through logs which parents and children kept over a 7-day period. The accuracy of logs was verified through interviews with children about the contents of selected books. Since the tradebook-textbook issue was not of concern in home reading, number of pages was used for that analysis.

Literature-selection strategies. Assessments were made of children's literature-selection strategies in two settings: (a) the naturalistic context of the weekly trip to the school library, and (b) a structured task which required children to differentiate between books of varying literary quality.

For the library task, each target child was observed for the entirety of one weekly library visit. This observation was followed immediately by an interview in which children's reasons for selections were elicited. The observation and interview produced two types of data: number of minutes spent in making selections, and strategies for making the selections.

For the structured task, children were asked to select the best book, then the next best book, and so on from among five books until all books had been ordered. The five books that were used in this task were: two tradebooks that two experts on children's literature had designated as high-quality literature (*Strega Nona's Magic Lessons*, de Paola, 1982; *Swimmy*, Lionni, 1963), a basal reading textbook from a recent series but not the one used in the skills-oriented classroom (second-grade reader of the Houghton-Mifflin series, Durr & Pikulski, 1986), and two popular books but not ones of high literary quality *(Bugs Bunny and The Health Hog*, Slater, 1986; *The Wuzzles and the Best Gift of All*, Hudson, 1986).

RESULTS

Amount of Reading

In considering students' reading in school, the lack of variation in the skills-oriented program and the extensive variation in the literature-based program meant that an analysis of variance was not run. As Table 1 shows, the number of words read differed greatly across the two programs. Overall, the literature-based groups read considerably more words than skills-oriented groups. Within the literature-based classroom, however, the difference between highs and lows was much more extensive than the difference between achievement groups in the skills-oriented classroom. The standard deviation for high achievers in the literature-based classroom was extremely large. This suggests that, when children are given choices in pace as well as content of reading, variation among children increases substantially.

A 2 × 2 (Program and Achievement Level) analysis of variance was run for home reading. There were no significant differences according to program or achievement level. As Table 1 shows, all groups read a considerable amount. However, variation within all groups was relatively large, especially for the low-achieving, literature-based group.

Table 1

Amount of Reading in School and at Home

	Literature-Based		Skills-Oriented	
	High-Achieving	Low-Achieving	High-Achieving	Low-Achieving
At School[a]				
M	22,731.00	8,384.20	6,805.00	4,643.40
SD	8,180.70	3,237.12	--	19.23
At Home[b]				
M	387.40	175.80	210.60	158.20
SD	286.02	176.32	155.05	121.93

[a] Number of words read.

[b] Number of pages read.

The analysis of variance for home reading did not produce a similar result. As Table 1 shows, all groups read a considerable amount. There were no significant differences according to program or achievement level. The amount of variation within groups, however, was considerable as is evident by the size of the standard deviations for groups, especially that of the low-achieving, literature-based group.

Literature-Selection Strategies

Amount of time spent in choosing books was considered next. From the means in Table 2, it should come as no surprise that a *t* test showed that students from the literature-based class spent more time choosing books (an average of 9 minutes more) than students in the skills-oriented class.

The pattern of book selection for students in the skills-oriented classroom was to go to one part of the library containing familiar books and immediately pull a book from the shelf after having examined the cover only; only one child sampled text. Most said their choice was because of interest in the topic. With no exceptions, all children in the literature-based classroom sampled text from one or more books before making their selections, either by reading parts of books to themselves or to another child. They also employed strategies like using the card catalog to find books on a desired topic, author, or illustrator.

The comparative rankings given by students in the two classrooms to the five books are presented in Table 2. The rankings of books are quite different between the approaches. It is difficult, however to ascertain a pattern for the rankings of either group. Students in the literature-based program selected a high-quality tradebook as their first choice, but the other tradebook was their fourth choice. The high ranking of one of the popular books (*Bugs Bunny and The Health Hog*, Slater, 1986) by both groups may seem surprising but not when viewed in relation to children's reasons, which had been elicited. In this book, Bugs Bunny was teaching good things about health which the children deemed to be important.

Table 2

Literature-Selection Tasks

	Literature-Based	Skills-Oriented
Minutes Spent Choosing Books		
M	11.60	2.60
SD	4.70	2.12
Differentiation of Texts		
1st	Swimmy	Bugs Bunny
2nd	Bugs Bunny	Adventures
3rd	Wuzzles	Strega Nona
4th	Strega Nona	Swimmy
5th	Adventures	Wuzzles

DISCUSSION

This study clarified some aspects of literacy acquisition that are typically overlooked in analyses of student outcomes. Low-achieving students in the literature-based classroom displayed literature-selection strategies similar to those of their high-achieving peers and read extensively, although this reading was not as extensive as that of their high-achieving peers. When students were given the opportunity to pace their own reading, as occurred in the literature-based classroom, differences in the amount of reading accomplished by students within an achievement level, for both high and low groups, over the course of one week was extensive.

The extensive amount of reading at home in both groups was unexpected. Although it is not clear whether this reflected the involvement of parents in keeping logs, one might speculate that this home literacy activity reflects the strong commitment to literacy in this community. It may also be that effects of classroom experiences that facilitate literature selection versus those that consist primarily of prescribed reading can only be viewed over the long run.

Even though the students in the skills-oriented classroom may have been making up for their lack of extensive reading experiences in self-selected books at school through their extensive reading at home, they were not developing the literature-selection strategies that distinguish avid readers. The nuances that go into book selection are many, as indicated by the children's ranking of books. The titles that were involved in this task undoubtedly had an effect. Furthermore, the presentation of the discrimination task did not focus on the purposes for reading, which is a critical element of reading.

The results of this study should be considered in light of their limitations as a preliminary investigation. Conclusions about students' literature-selection strategies were based on one library visit, and conclusions about amount of classroom reading were based on one week of school.Literature-based students, especially high achievers, quickly read books and talked or wrote about only a small portion. Skills-oriented students were questioned about everything they read. Another limitation of this study is the focus on only one classroom of each type. Differences in the implementations of teachers who claim to espouse the same philosophy can be extensive (Chall & Feldman, 1966). Although observations in the classrooms confirmed that teachers' practices maintained fidelity to their philosophies, findings based on students from one classroom representing an approach must be considered as tentative. Finally, proficient reading involves a myriad of strategies and the view presented here was limited to literature-selection strategies and amount of reading. Other strategies such as word-level ones may be better facilitated in a skills-oriented approach. It was expected that a program that encourages students' selection of literature would facilitate such strategies to a greater extent than an approach that does not promote such opportunities. The purpose in conducting this study was to highlight such strategies, which have typically been forgotten in assessments and consequently overlooked in instruction.

Even with these limitations, the results are provocative enough to encourage us to further examine issues related to children's literature selection and amount of reading. Answers to questions about literature-selection strategies and quantity and quality of children's reading are important to document if literature-based experiences are to be an enduring part of reading instruction rather than to come and go as a fashionable trend every decade or so.

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NRC AND THE POLITICS OF LITERACY: A REPORT BY THE LEGISLATIVE AND POLICY COMMITTEE

Rosalind Horowitz
University of Texas—San Antonio

Janet Johnson
Michigan State University

Barbara Kapinus
Maryland State Department of Education

Sam Miller
University of North Carolina—Greensboro

Lynne Smith
Northern Kentucky University

Linda Vavrus
Stanford University

Peter Winograd
University of Kentucky

Should the National Reading Conference (NRC) become involved in various legislative and policy issues related to literacy or should NRC limit its focus to basic and applied research? Would involvement in various legislative and policy issues change the character and purpose of NRC? If NRC does become involved in legislative and policy issues, then which issues are critical to NRC? Once an issue has been identified as important to the members of NRC, then should the organization take a specific stand or should it act as a clearing house for relevant information? To explore these questions, the Legislative and Policy Committee conducted a survey of the membership of NRC during September of 1988.

THE SURVEY

A questionnaire consisting of both forced-choice and open-ended items was developed to determine NRC members' attitudes concerning various legislative and policy issues related to literacy and the possible roles that NRC might assume in helping members address those issues. The questionnaire included three sections: Part I focused on possible roles NRC might assume in response to legislative and policy issues by using five forced-choice and two open-ended items; Part II focused on respondents' degree of concern about various literacy issues through 28 forced-choice and one open-ended item; Part III used five open-ended items to learn about those issues that NRC members were currently addressing, planned to address, or had addressed on a state or local level; resources that had been helpful in the past; and means by which respondents believed that NRC could help them with those issues in the future.

RESULTS

Of the 875 surveys that were sent, 206 (24%) were returned in time to be included in the analyses. Professors returned 145 of these responses; public school personnel returned 22 responses; graduate students returned 10; people at research or regional laboratories returned 9; publishers returned 3; individuals at state departments of education returned 2; and the rest were returned from respondents in "other" positions. Almost all of the responses (193: 94%) came from the United States, particularly (81: 39%) from the states of California, Illinois, Michigan, New York, Ohio, and Texas. One response came from Denmark; the rest came from Canada. In certain cases, individuals returning surveys did not respond to all questions included on the form.

Part I

Forced-choice items. The forced-choice items in Part I surveyed opinions concerning whether NRC should (a) avoid involvement (Question 1) or become more involved (Question 2) in legislative and policy issues, (b) maintain its present role (Question 3), (c) take specific stands on certain legislative and policy issues (Question 4), or (d) act as an informational clearing house on legislative and policy issues (Question 5). The data from this part of the survey are presented in Table 1.

Note that for each of the three questions (#1, #2, #4) that focused on the feasibility of becoming involved with legislative and policy issues, about a third of the respondents wanted NRC to avoid becoming involved whereas a little over half of the respondents wanted NRC to become more involved. Note, also, that only a few of the respondents were undecided in their opinions. The correlations among these three questions were high (Questions 1 & 2, $r = .94$; Questions 1 & 4, $r = .84$; Questions 2 & 4, $r = .85$). On Question 5, the majority of the responses (71%) strongly agreed or agreed that NRC should act as an informational clearinghouse.

Open-ended items. Part I also included two open-ended items that probed members' opinions about how NRC should determine which issues to address (Question 6) and how NRC's efforts related to policy and legislative issues should differ from those of the International Reading Association (Question 7).

Four general methods of determining which issues to address and positions to take emerged from the 134 responses to Question 6:

1. Survey or poll the general membership of NRC (37.3%).
2. Use a committee (e.g., the Legislative and Policy Committee, task force, or advisory board) to select and frame issues for the membership (21.7%).
3. Provide open forums (e.g., working or plenary sessions) at the annual conference for consideration of issues (10.5%).
4. Rely on the elected leadership for guidance in setting the organizational agenda on issues and policy positions (7.5%).

Although there was a variety of suggestions about how NRC could determine which issues to address, there was strong consensus that the general membership should be involved in the process. As one member stated, "Whatever specific mechanism is used, it is crucial that all members have a vote on issues so that the NRC

Table 1

Responses to Questions Concerning the Role NRC Should Assume on Legislative and Policy Issues Related to Literacy

	Response				
Question	Strongly Agree (1)	Agree (2)	Undecided (3)	Disagree (4)	Strongly Disagree (5)
1. NRC should avoid becoming involved in legislative and policy issues and limit its focus to basic and applied research in literacy. (*N* = 203)	21%	16%	7%	32%	24%
2. NRC should become more involved in legislative and policy issues related to literacy. (*N* = 202)	27%	30%	8%	19%	16%
3. The current situation is fine; NRC has already achieved a proper balance between basic and applied research issues and legislative and policy issues. (*N* = 190)	3%	21%	28%	41%	7%
4. NRC should take specific stands on certain legislative and policy issues. (*N* = 201)	17%	38%	11%	19%	14%
5. NRC should act as an informational clearinghouse for information related to legislative and policy issues. (*N* = 200)	32%	39%	11%	12%	6%

Executive Board would know how many members support or oppose it. Such a vote should be preceded by a full discussion on the issue."

The thoughtful responses to the two open-ended questions posed in Part I deserve some detailed consideration. For example, those respondents who wanted NRC to avoid becoming more involved in legislative and policy issues provided three general reasons for their concern. First, they stated that taking positions is not the proper role for NRC which is a research-focused organization. Members noted, for example, that "NRC should position itself as the premier disseminator of research in the field of reading . . . . We should not become mired in policy/legislative issues," and ". . . such efforts will dilute the excellent focus on basic and applied research we have now."

Second, some respondents were concerned that taking specific stands would seriously divide the membership, given the diversity of views on literacy issues among members of NRC. Several respondents noted that NRC is simply not large enough to take on political and legislative activities. The kind of political activity that seemed to be viewed unfavorably was defined as "taking a stand" or "lobbying for a particular position." One respondent observed, "This is the problem; coming up with just one stand on a particular issue flies in the face of the kind of forum NRC is about." This sentiment was also reflected in responses to Question 7 regarding perceived differences between NRC and IRA. One member explained:

> "IRA gets involved with legislation and policy and is large enough to be able to diversify in these directions while doing other important things. This kind of diversification is more than NRC can support while maintaining its research focus with strength."

Third, several respondents characterized the key role for NRC as one of providing information; many comments were consistent with the strong support (71%) given to the idea of NRC acting as an informational clearinghouse for policy issues. Several members, for example, noted that active involvement costs money that could better be spent in support of research.

The theme that NRC's research focus was distinctive dominated the responses ($n = 132$) to Question 7 in Part I. For example, "NRC should be a forum for discussion of research findings—not political issues; we should avoid becoming a mini-IRA," and "A professional organization of *researchers* like NRC should supply reasoned summaries of the research on an issue that may be in dispute . . . and not come out with positions of its own. What virtue is there in becoming a professional lobby group instead of a resource?"

Respondents who felt that NRC should become more involved in legislative and policy issues also provided thoughtful reasons for their points of view. Indeed, the number of respondents advocating a voice on political issues for NRC suggests that the membership has gained confidence in being able to supply the research base to support the consideration of legislative and policy issues. Greatest support (34%) was given to exploring ways NRC can complement or coordinate with the work of other literacy and research organizations (i.e., IRA, AERA, NCTE, etc.). Several members suggested that NRC should formalize some kind of collaborative relationship with IRA that would at least keep each organization informed about the work of the other on literacy policy issues. Comments like the following characterize this view: "NRC has a unique strength in developing a strong, theoretical basis for certain policy stands—complementary to IRA's field as classroom-based . . . ." and "The efforts should be joint . . . otherwise we run the risk of losing credibility and looking like a profession without any clear agenda or direction." Those respondents who advocated "leaving the politics to IRA" most often cited differences in organizational size and constituency as reasons. Many, however, suggested some level of activity on political issues was desirable, mirroring the sentiments of this member: "Open debate at conferences instead of 'meet the researchers on Saturdays' is desirable. The membership pretends that they are not making policy statements with their silence."

Those advocating a major policy voice for NRC most often stated that NRC's research focus and lesser vulnerability to co-option from commercial or special-interest groups could give NRC a potential strength unavailable to IRA. Finally, responses to Question 7 also indicated that many members are unfamiliar with both NRC's and IRA's current policy regarding political and legislative issues.

Overall, then, three major themes emerged from the responses to the questions posed in Part I. First, a majority of the respondents thought that NRC should become more involved in legislative and policy issues related to literacy. Second, the respondents felt that the general membership of NRC should be involved in determining the extent and nature of this involvement. Third, while a range of issues were suggested as appropriate for consideration by NRC, respondents stressed the importance of focusing on research-based issues and taking positions that are consistent with NRC's goals as a research organization.

Part II

In the second section of the survey, respondents rated their concerns about 28 literacy-related issues on a scale that ranged from "Not Concerned" (1) to "Very Concerned" (5). Table 2 presents data for each of the 28 issues. Note that, in general, the members of NRC who responded to this survey expressed high levels of concern regarding the political issues related to literacy.

Table 2 also contains the results of an analysis conducted to determine whether there were any systematic differences in how various NRC members responded to different issues. For this analysis, respondents were assigned one of two groups. Those individuals who stated that they "Strongly Agreed" or "Agreed" with the statement that NRC should avoid becoming involved with legislative and policy issues and limit its focus to basic and applied research were placed in Group 1 ($N=76$). Those who stated that they "Strongly Disagreed" or "Disagreed" with this statement were placed in Group 2 ($N=113$). As the information in Table 2 reveals, significant differences between respondents in Groups 1 and 2 were found on 12 of the 28 items. Note, however, that most of the differences between the two groups occurred on those items that received the lowest rankings and rarely exceeded a half point on a 5-point scale.

Part III

Part III of the survey asked respondents to identify (a) issues related to literacy that they were currently addressing (Question 1), or anticipated addressing (Question 2), or

Table 2

Rank and Mean Ratings Indicating Level of Concern Expressed Over Various Literacy Issues by Group

Rank	Item	Tag	Total Mean	Group 1	Group 2
1	3	At-Risk Children	4.4	4.3	4.5
2	2	Assessment	4.3	4.1	4.4*
3	15	Funding for Research	4.1	4.1	4.1
4	25	Textbook Quality	4.1	4.1	4.2
5	16	Integration of Reading & Language Arts	4.0	3.9	4.0
6	12	Curriculum Mandates	3.9	3.8	4.1
7	21	Standardized Tests	3.9	3.8	4.0
8	1	Adult Literacy	3.8	3.7	3.9
9	22	Teacher Certification	3.8	3.6	3.9*
10	28	Whole Language	3.8	3.6	3.9
11	4	Basal Readers & Reading Researchers	3.7	3.6	3.7
12	5	Basic Competency Testing	3.7	3.5	3.9*
13	23	Teacher Competency Testing	3.7	3.5	3.9*
14	14	Early Childhood Education	3.6	3.6	3.7
15	24	Textbook Adoption	3.6	3.5	3.6
16	26	Thinking Skills Assessment	3.6	3.3	3.8*
17	27	Thinking Skills Curriculum	3.5	3.2	3.7**
18	7	Censorship	3.4	3.2	3.6*
19	14	Mainstreaming vs. Pullout	3.4	3.2	3.5*
20	18	NAEP Assessment	3.4	3.4	3.5
21	9	Compensatory Education	3.2	2.9	3.4**
22	11	Criterion-Referenced Tests	3.2	3.0	3.4*
23	6	Bilingual Education	3.1	3.0	3.3
24	13	English as the Official Language	3.1	2.7	3.3**
25	20	Role of Technology	3.1	3.1	3.1
26	8	Class Size	3.0	2.8	3.1
27	10	Cultural Literacy	3.0	2.8	3.2*
28	19	Private vs. Public Education	2.6	2.5	2.7

Note: Item Response Format: 1 = Not Concerned, 3 = Somewhat Concerned, 5 = Very Concerned. Group 1 = Respondents who felt that NRC should *avoid* becoming involved in legislative and policy issues ($N = 76$). Group 2 = Respondents who felt that NRC should become *more* involved in legislative and policy issues ($N = 113$).

*Significance at .05 Scheffe Test. **Significance at .01 Scheffe Test.

had addressed (Question 3) at the local, state, or national level; and (b) resources that they had found useful in the past (Question 4) and would like to have available in the future (Question 5). Responses were similar for the first three questions that addressed present, future, and past issues faced by members. Issues most often identified included assessment, at-risk populations (including dropouts, English as a second language students, and minorities), adult literacy, curriculum issues (e.g., whole language, basal adoptions, etc.), teacher preparation and certification, early childhood and kindergarten instruction, and funding for research. Respondents stated that they had encountered these issues in a variety of contexts including state mandates and legislation, school district priorities, local school board actions, parent interest groups, and university policies and programs.

Questions 4 and 5 in Part III dealt with the resources that respondents had found helpful in the past and the types of resources they would like to have in the future to address literacy issues and projects. Specific resources listed in answer to Question 4 included national organizations such as NRC, IRA, and NCTE as well as state and local organizations. State departments of education and institutions such as the Center for the Study of Reading at the University of Illinois were also named. Publications were cited as being helpful and included specific journals and state and local reports. A long list of individuals who have been resources indicated that many respondents ask "experts" or colleagues for assistance.

A few of the responses to Questions 4 and 5 in Part III of the survey indicated that some members of NRC were particularly concerned with one or two specific issues such as whole language, adult literacy, or assessment. However, a number of responses to Question 5 requested resources that could be used to address a variety of issues depending upon shifting public interests and legislative pressures.

Although respondents named individuals, organizations, publications, and documents as sources of assistance, many members mentioned the importance of developing networks of people and organizations, and position papers that would pull together, synthesize, or organize individual resources. Those who responded to Part III of the survey indicated that they lacked the resources from which to procure information, direction, advice, and support that would allow them to address salient issues in an intelligent and informed manner. Thus, although a great many resources appear to be available according to Question 4, there does seem to be a need for an organized system for learning about and accessing those resources.

The responses to the questions posed in Part III suggests some initial roles for NRC with respect to legislative and policy issues. Interested NRC members could begin by developing the position papers, networks, files of relevant information, and other kinds of information requested by those who responded to Question 5.

DISCUSSION

This survey examined NRC members' opinions concerning different literacy issues and the possible roles that NRC might assume in regard to these issues. Clearly, the members of NRC who responded to the survey are concerned about a wide variety of legislative and policy issues related to literacy. It is also clear that members thoughtfully disagree about the extent to which they believe that NRC should become directly involved in literacy issues. Suggested options for the role of NRC spanned the continuum, ranging from direct involvement by attempting to effect legislative policy to less-direct involvement such as acting as an informational clearinghouse to no involvement. It is clear that there needs to be continued discussion on NRC's role in regard to legislative and policy issues related to reading. Our recommendation, however, is that NRC begin to explore how it can use its unique and scholarly character to become more involved in legislative and policy issues related to literacy.

The results of the survey also revealed that the majority of respondents feel that

NRC should act as an informational clearinghouse. Thus, we recommend that lists of individuals, documents, publications, and organizations provided in response to the questions in Part III could serve as an initial data base related to literacy issues. In addition, many of the items that were requested as resources in Question 5 in Part III could be generated, at least initially, as follow-ups to sessions presented at NRC. For example, after a session on adult literacy research, a paper could be circulated to get the names of people interested in becoming involved in a network dealing with adult literacy issues. Conference papers related to specific issues could be gathered and either synthesized or disseminated as a collection. Initial lists of organizations or people to contact in order to find information on an issue could be generated at NRC sessions.

Much informal networking takes place at NRC. Perhaps time and space could be set aside for policy-related interest groups to meet to discuss issues and share resources. This would give NRC the opportunity to support resource networks that facilitate efforts to gather and disseminate information on legislative and policy issues related to literacy.

In conclusion, the survey revealed that the membership of NRC is concerned about the political complexities surrounding literacy research and instruction. Moreover, the membership is acutely aware of the importance of safeguarding the special character of NRC while, at the same time, using the organization's considerable resources to promote the study and dissemination of information about literacy and literacy instruction across the full variety of forums and contexts that so profoundly influence the teaching of reading and writing.

PROGRAM FOR 1988
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001.1 **A longitudinal view of how children develop characters in fiction.** Donald Graves, University of New Hampshire

001.2 **A case study of the process of children's development of character in fiction.** Margaret Murray, University of New Hampshire

001.3 **Children's use of life themes as they relate to the development of character in fiction.** Jane Hansen, University of New Hampshire

002.0 **Learning from expository text: A synthesis of research on teaching text structure and suggestions for new directions**

002.1 **Issues in transferability in teaching students to recognize specific text structures.** Renee Weisberg, Beaver College, and Ernest Balajthy, SUNY at Geneseo

002.2 **Assessment and instruction for reading comprehension of expository text.** Lea McGee, Louisiana State University, and Donald Richgels, Northern Illinois University

002.3 **Teaching expository text structure: A practitioner's view.** Richard Santeusanio, Danvers Public Schools

002.4 **Teaching text patterns: Issues, problems, prospects.** Rosalind Horowitz, University of Texas—San Antonio

003.0 **Preservice teacher education**

003.1 **The influence of student teaching on student teachers' language arts philosophy and practices.** Sandra Wilde, University of Nevada—Reno, and Maria Yon, University of North Carolina—Charlotte

003.2 **Preservice teachers' application of a model for planning directed reading lessons.** Gerry Shiel, University of Northern Colorado

003.3 **The relationship between undergraduate preparation and teaching: Case study of a third-year teacher.** Maria Yon, University of North Carolina—Charlotte, and Mary Barksdale, Virginia Tech

004.0 **Home factors and achievement**

004.1 **Factors associated with the long-term achievement of early readers.** John Pikulski, University of Delaware, and Aileen Webb Tobin, U.S. Army Ordnance Center and School

004.2 **The effect of mobility on the reading achievement of grade-six students.** Roger Johnson, Old Dominion University, and Arnold Lindblad, Chesapeake Public Schools

004.3 **The influence of home literacy events on prereaders' story knowledge.** Joanne Ratliff, University of Central Florida, Ray Buss, University of Northern Iowa, and Karen LaCroix, East Baton Rouge Public Schools

005.0 **Spelling and reading**

005.1 **Twins reared apart: Genetic and cognitive factors in spelling.** Thomas Bouchard, Nancy Segal, and Jay Samuels, University of Minnesota

005.2 **Beginning spelling: Its movement through stages and its relationship to reading.** Ruth McArthur, University of Houston

005.3 **Reading and spelling connections for third-grade students.** Jerome Zutell, Ohio State University

006.1 **Reading and studying in college: A follow-up.** Vincent Orlando and David Caverly, Metropolitan State College, Rona Flippo, Fitchburg State College, and Jo-Ann Mullen, University of Northern Colorado

006.2 **How figurative language communicates "inexpressible" meaning.** Sarah Webb, University of Texas at Austin

006.3 **The development and validation of a model for text coherency.** Marian McKenna, University of Colorado at Boulder

006.4 **Peeling away onion layers: Multiple analyses of descriptive data.** Karen Feathers, East Texas State University

006.5 **The Qualitative Reading Inventory: Issues in the development of a reading diagnostic test.** Lauren Leslie, Marquette University, and JoAnne Caldwell, Cardinal Stritch College

007.1 **Spatial aids and comprehension: The effects of ability, preference and instruction.** Phillip Moore and Jill Scevak, University of Newcastle.

007.2 **Incidental learning of word meanings from context: Effects of task and prior knowledge.** Steven Stahl, Western Illinois University

007.3 **The nature of expertise in news writing.** Gary Schumacher, Jane Gradwohl, Mary Brezin and Donald Lambert, Ohio University, Byron Scott, University of Missouri

007.4 **Kaleidoscopic images: Shifting designs of descriptive research.** Jane White, East Texas State University

007.5 **Beyond Vinsonhaler: Problem identification skills and strategies of expert diagnosticians.** Susan Magliaro, Virginia Tech

008.0 **Reading in the writing process**

008.1 **How writers locate and evaluate informational sources: Content-driven and issue-driven approaches.** Jennie Nelson, California State University

008.2 **Reading, writing, and the transformation of ideas.** Cheryl Geisler, Rensselaer Polytechnic Institute

008.3 **Effects of writing and studying on elaboration during reading.** Ann Penrose, North Carolina State University

008.4 **A sense of one's own text: Problems writers encounter in building text representations.** Christina Haas, Carnegie Mellon University

009.0 **Text factors in beginning reading**

009.1 **Characteristics of texts that support beginning readers.** Barbara Peterson, Ohio State University

009.2 **Using phrase-cued texts to facilitate reading performance: A review.** Timothy Rasinski, University of Georgia

009.3 **Prediction instruction in basal readers.** Peter Afflerbach and Brian Walker, Emory University

010.0 **Studies of classroom practice**

010.1 **Teachers' use of social studies text.** Carol Wiechmann and Judith Winn, Michigan State University

010.2 **Engagement strategies employed by intermediate level teachers in assigning and supervising students' independent reading tasks.** William Rupley and Victor Willson, Texas A&M University

010.3 **The relative merits of characteristics of teacher verbal modeling in influencing comprehension and comprehension monitoring of eighth-grade readers.** Jeanne Ehlinger, Indiana University

011.0 **Emerging views of reading: Beyond schema theory**

011.1 **Overview.** Robert Carey, Rhode Island College

011.2 **Reading as inquiry.** Marjorie Siegel, University of Rochester

011.3 **Beyond schema theory: Developing flexible background knowledge for independent reading comprehension in the content areas.** Rand Spiro, Jihn-Chang Jehng, Aydin Durgunoglu, William McGinley, and Michael Jacobson, University of Illinois-Champaign, and Paul Feltovich, University of Southern Illinois Medical School

011.4 **The engagement factor: Understanding readers' & writers' negotiations across multiple dimensions of experiences with text.** Robert Tierney and Patricia Edmiston, Ohio State University.

012.0 **Phonological processing**

012.1 **The relationship of certain aspects of phonemic memory to phonological decoding in reading.** Lois Dreyer, Columbia University

012.2 **Development of first graders' word processing skills.** Barbara Foorman and Dov Liberman, University of Houston

012.3 **Naming speed and phonological awareness: Separable roles in reading disability.** Patricia Bowers, University of Waterloo

013.1 **Effects of textual and contextual importance assignment by college students in science study.** Linda Johnson, University of Iowa

013.2 **Judgments on accuracy and prior knowledge requirements of science analogies.** Ronald Leslie and June Zack, New York University, Elizabeth Getlik and Michael Petrella, Waldwick High School

013.3 **Politics, policy and reading research.** Patrick Shannon, University of Minnesota/Duluth

013.4 **Analyses and comparisons of cohesive features in rewritten and original classic texts: Limitations for use with deaf students.** Tane Akamatsu, Michigan State University

013.5 **Using students' perceptions to diagnose their reading strategies.** Samuel Miller, University of North Carolina at Greensboro, and Nina Yochum, University of Michigan at Flint

014.1 **The effects of reciprocal teaching of self-regulation of reading comprehension in a post-secondary technical school program.** R. Timothy Rush and James Milburn, University of Wyoming

014.2 **Defining is an unnatural act: Definitions composed by fourth graders and their teachers.** Camille Blachowicz and Peter Fisher, National College of Education

014.3 **The translation of reading comprehension research into teacher practice literature.** Carol Lloyd, Ann Batchelder, Deborah Tidwell, and Elizabeth Morgan, University of Arizona, Lois Coleman, Nebraska Wesleyan University

014.4 **Concepts about reading from a developmental perspective.** Diane Stupay, Harvard University, and Catharine Knight, Cleveland State University

014.5 **Affective components of comprehension.** Robert Gaskins, SUNY—Albany

015.0 **Ways in which low-SES children make sense of instruction in reading and writing in the early grades.**

015.1 **Knowledges about written language help by low-SES children entering kindergarten.** Victoria Purcell-Gates and Susan Michel Law, University of Cincinnati

015.2 **The construction of knowledges about written language by low-SES children.** Karin Dahl, University of Cincinnati

015.3 **The construction of written language knowledges in out-of-school settings by urban kindergartners.** Ellen McIntyre, University of Cincinnati

016.0 **Factors affecting secondary school success: Teachers and texts**

016.1 **Preservice teachers, secondary classroom teachers and teacher educators: A model which promotes effective instruction and learning.** Diane Lapp and James Flood, San Diego State University, Doris Alvarez, Hoover High School

016.2 **Potential accessability of concepts in vocational texts.** Patricia Anders and David Scanlon, University of Arizona

017.0 **Instructional effects**

017.1 **Teacher effects on student beliefs about control of the writing process.** Kathleen Fear, Michigan State University

017.2 **Summarization instruction and text availability: Effects on quality of science text summarization.** Martha Head, Southeastern Louisiana University, Leslie Arceneaux and John Readence, Louisiana State University

017.3 **The effects of cognitive strategy instruction on elementary students' reading outcomes.** Stephanie Knight, University of Houston—Clear Lake

018.0 **The social context of reading revisited**
018.1 **Reading as rational action: literacy and functioning in daily life.** James Heap, Ontario Institute for Studies in Education
018.2 **Connections between language and learning in the classroom: Problems and directions.** Theresa Rogers, Ohio State University
018.3 **Particularity, culture, history and language: Some issues in the social context of reading.** David Bloome, University of Massachusetts
019.0 **A structural approach to decoding and spelling curriculum and instruction: A design for transfer**
019.1 **Structural and historical foundations for the English spelling-sound system.** Robert Calfee, Stanford University
019.2 **Understanding Spanish orthography: Teaching for transfer.** Robin Avelar-LaSalle, Stanford University
019.3 **Effects of metalevel instruction on learning disabled children's decoding and spelling.** Marcia Henry, San Jose State University
020.1 **Specifying the prior knowledge-advance organizer interaction in young children's comprehension.** Michael Townsend, University of Auckland
020.2 **On planning and writing plans—or what's in a name?** Sandra Stotsky, Harvard Graduate School of Education
020.3 **Deduction in the theory and teaching of reading.** Grover Mathewson, Florida International University
020.4 **A longitudinal assessment of preschool literacy concepts and their relationship to school-age reading achievement.** Mary Huba, Iowa State University
0.21.1 **Teachers' implementations of research-based reading comprehension practices.** Carol Lloyd, Deborah Tidwell, Judy Mitchell and Margaret Gallego, University of Arizona
0.21.2 **Relationships between imagery, affect, and structural salience in journalistic text.** Mark Sadoski and Zeba Quast, Texas A & M University
021.3 **The effectiveness of using interactive computer programs to model textbook reading strategies for university and community college psychology and biology students.** Larry Mikulecky and Susan McIntyre-Adams, Indiana University
021.4 **A longitudinal study of children's evolving knowledge of the characteristics of word.** Beth Spencer, Emory University
021.5 **Text meets text—Reading meets writing.** Trevor Cairney, Riverina-Murray Institute of Higher Education
022.0 **Reading-to-write and the development of strategic knowledge**
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022.2 **Differences in the use of prior knowledge in two reading-to-write tasks.** Victoria Stein, Carnegie Mellon University
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022.4 **Disciplinary knowledge and reading-to-write.** John Ackerman, Carnegie Mellon University
023.0 **Content area text and instruction**
023.1 **The effect of a direct instruction text structure procedure on the comprehension, recall, and metacognitive knowledge of low ability junior high school students.** Nancy Beck and Sherrie Shugarman, University of Dayton
023.2 **Effects of mnemonic imagery training on fourth graders' recall of content material.** Bonnie Konopak and Nancy Williams, Louisiana State University
023.3 **Teaching vocabulary, reading comprehension and summarizing in the content area.** Eileen Carr and Helen Hunt, University of Toledo, and Mary Bigler, Eastern Michigan University

024.0 **Preservice teachers' development of professional knowledge**

024.1 **The sense preservice teachers make of their language arts/reading methods classes and field placement experience.** Jamie Myers, Wayne Serebrin, Caroline Beverstock, Brian Smitten and Pat Bowman, Indiana University

024.2 **Knowledge shifts in preservice teachers engaged in self-sponsored learning activities.** Robert Tierney and J. Michael Gee, Ohio State University

024.3 **The evolution of preservice teachers' knowledge structures.** Beth Herrmann, University of South Carolina

025.0 **Emergent literacy**

025.1 **The relationship between early patterns of literacy behavior in kindergartners and later school achievement.** June Barnhart, Northern Illinois University

025.2 **Preschoolers' use of metacognitive strategies in self-selected literacy events.** Deborah Rowe, Vanderbilt University

025.3 **Emerging ability to think critically: One preschooler's experiences with interactive storybook reading.** Sue Hernandez, Louisiana State University

026.0 **Orthographic awareness reflected in metalinguistic observation, levels of response to literature and writing fluency, divergent research trends within one classroom**

026.1 **Words about words: Metalanguage in informal and formal instructional contexts.** Shane Templeton, University of Nevada—Reno

026.2 **Young children's written response to text.** Diane Barone, University of Nevada—Reno

026.3 **Writing and reading fluency, and orthographic awareness.** Donald Bear, University of Nevada—Reno

027.1 **The relationship of vocabulary knowledge and topic familiarity to reading comprehension.** John Naillis, University of Cincinnati

027.2 **Evaluating the use of verbal reports in reading research.** Linda Phillips and Stephen Norris, Memorial University of Newfoundland

027.3 **Children's specification of context within story organization.** Beverly Cox, Purdue University, and Margaret Tinzmann, Aquinas College

027.4 **Transitional knowledge in emergent literacy: Multiple case studies.** George Kamberelis, University of Michigan

028.1 **Instructional questions which promote students' story comprehension: A description of questions that work.** David Dunning, University of Delaware.

028.2 **The influence of computer assisted language experience stories on first graders' emergent reading and writing behaviors.** Mary Heller, Kansas State University

028.3 **Sex and ethnic group differences in comprehension of high and low interest reading material in New Zealand children.** Michael Townsend, University of Auckland, and Jane Townsend, Auckland Education Board

028.4 **Exploring the ontogenesis of the registers of written language: Young children tackling the "book language" of information books.** Christine Pappas, University of Kentucky

029.1 **Political and economic dimensions of literacy: Challenges for the 1990s.** M. Trika Smith-Burke, New York University

031.0 **Validating the tried, but not necessarily the true, in comprehension instruction**

031.1 **Vocabulary instruction, comparing the effects of semantic mapping and extensive practice.** Dorothy Roy-Figy and Martha Czecholinski, Toledo Public Schools

031.2 **Does training in predictions improve the comprehension of good and poor readers.** Kristine Edler, Toledo Public Schools, and Peter Dewitz, University of Toledo

031.3 **The effects of the junior great books program on inferential comprehension.** Ann Heinl, University of Toledo

031.4 **Measuring children's procedural knowledge of comprehension.** Eileen Carr, University of Toledo

032.0 **Towards an instructional model: Interactive practices, teachers, and elementary-level bilingual learning disabled students**

032.1 **A comparison of vocabulary instructional practices on bilingual learning disabled students' reading comprehension.** Candace Bos, Adela Allen and David Scanlon, University of Arizona

032.2 **Adaptation of theoretically linked practices by the teachers who use them.** Patricia Anders and Margaret Gallego, University of Arizona

032.3 **The use of two languages as a resource for mediating comprehension.** Grace Duran and Elba Reyes, University of Arizona

033.0 **Promoting literate behavior in discussions: Three initiatives, three grade levels**

033.1 **A synthesis of theories of discussion.** John O'Flahavan, University of Illinois, Center for the Study of Reading, Evelyn Hanssen, Indiana University, and Steven Athanases, Stanford University

033.2 **Conversational group discussions: A study of second graders leading their own discussions.** John O'Flahavan, University of Illinois, Center for Study of Reading

033.3 **Literate circles: Contexts for the development of literature behavior.** Evelyn Hanssen, Indiana University

033.4 **Recitation and discussion in high school talk about literature.** Steven Athanases, Stanford University

034.0 **Learning to read: Implications from longitudinal studies of at-risk children**

034.1 **A longitudinal study of at-risk children.** Gay Su Pinnell, Ohio State University

034.2 **A critical analysis of comprehending within the teaching setting of reading recovery lessons.** Billie Askew, Richardson Independent School District

034.3 **A comparison of miscue behavior on texts read above 90% and below 90% with level of classroom basal reader placement in second and third grade students served in reading recovery as first graders.** Diane DeFord, Ohio State University

034.4 **Patterns of oral reading behavior in learning disabled students in reading recovery: Is a child's learning disability environmentally produced?** Carol Lyons, Ohio State University

035.1 **What's happening in the states? A report on current literacy issues and programs.** M. Trika Smith-Burke, New York University

036.1 **The comprehension strategies of competent college readers.** Ellen Block, Baruch College/CUNY

036.2 **Revisions as artifacts of beliefs about writing.** David Huestis, Halifax County—Bedford School District, and Allan Neilsen, Mount Saint Vincent University

036.3 **Variables associated with second-grade students' ability to identify polysyllabic words.** John Shefelbine and Luci Lipscomb, University of Texas, and Alison Hern, Round Rock Independent School District

036.4 **The relationship of headings, questions, and prior knowledge to multiple-choice test performance.** Stephen Wilhite, Widener University

036.5 **Using computer-assisted instruction (CAI) and telecommunications to enhance collaborative writing skills.** Ann Duin, University of Minnesota

037.1 **Preservice teachers' resistance to content reading instruction: A qualitative construction of why every teacher is NOT a teacher of reading.** David O'Brien and Roger Stewart, Purdue University

037.2 **Effects of a writing strategy on sixth graders' content learning.** Bonnie Konopak, Louisiana State University, Michael Martin and Sarah Martin, Eastern Michigan University

037.3 **A chronometric analysis of cognitive processes in text search.** Mariam Dreher and John Guthrie, University of Maryland

037.4 **The nature and influence of text corpora and teacher factors on student learning in social studies units.** Mark Aulls, McGill University

037.5 **The influence of print size, vocabulary difficulty, and interest on the reading self-efficacy judgments of high achieving and low achieving high school readers.** Charlene Liesveld, University of Nebraska—Lincoln

038.1 **Designing invitations to thinking: Some initial thoughts.** John Bransford, Vanderbilt University

039.0 **Instruction in analogy, analogy in instruction**

039.1 **Text-based analogies and reader concept learning in high school biology.** Thomas Bean, California State University—Fullerton

039.2 **The relationship between vocabulary knowledge and young children's analogy performance.** Stephen White, University of Georgia

039.3 **Training in analogical reasoning: What is the effect on text comprehension?** Patricia Alexander, Texas A&M University

040.0 **Developments in second language reading research**

040.1 **Second language reading of German, Chinese, and Japanese: A meta-analysis of three eye tracking studies.** Michael Everson, U.S. Air Force Academy, and Fumiko Harada, Ohio State University

040.2 **Awareness of text structure: The question of transfer from L1 to L2.** Sally Hague, University of Georgia

040.3 **The casual network model and second language reading.** James Davis, Penn State University

041.0 **Toward an understanding of strategic literacy learning: A collaborative research study in a transition first-grade classroom**

041.1 **Looking at literacy from a semiotic perspective.** Heidi Mills, University of South Carolina

041.2 **Examining socio-psychological learning strategies across sign systems.** David Whitin, University of South Carolina

041.3 **Exploring the role of reflection in literacy learning.** Timothy O'Keefe, R. Earl Davis Elementary School

042.0 **A classification scheme for categorizing children's questions during storybook reading: Theoretical development, empirical refinement and applied uses**

042.1 **A classifying scheme for categorizing the types of questions that children ask during storybook read-alouds: Theoretical and empirical proofs.** David Yaden, Jr., University of Houston

042.2 **An experimental investigation of the effect of print-salient aspects of picture storybooks and rereadings upon preschoolers' questions during home read-alouds.** Alice Conlon and Laura Smolkin, University of Houston

042.3 **Using children's questions as a model for training lower socio-economic status parents.** Jean Mosley, Louisiana State University

043.0 **Remedial and compensatory education**

043.1 **Effects of setting on instructional practices, student activities, and congruence in a remedial reading program.** Rita Bean and R. Tony Eichelberger, University of Pittsburgh

043.2 **Guided instruction in trade books to increase the reading achievement of primary reading-disabled children.** Margaret Richek, Northeastern Illinois University, and Becky McTague, Harvey Public Schools

043.3 **The social construction of learning problems: Language use in a special education resource room.** Patricia Cousin, California State University—San Bernardino

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